Industry Power

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OCTOBER 1956

For Men Who Manage

Power Services

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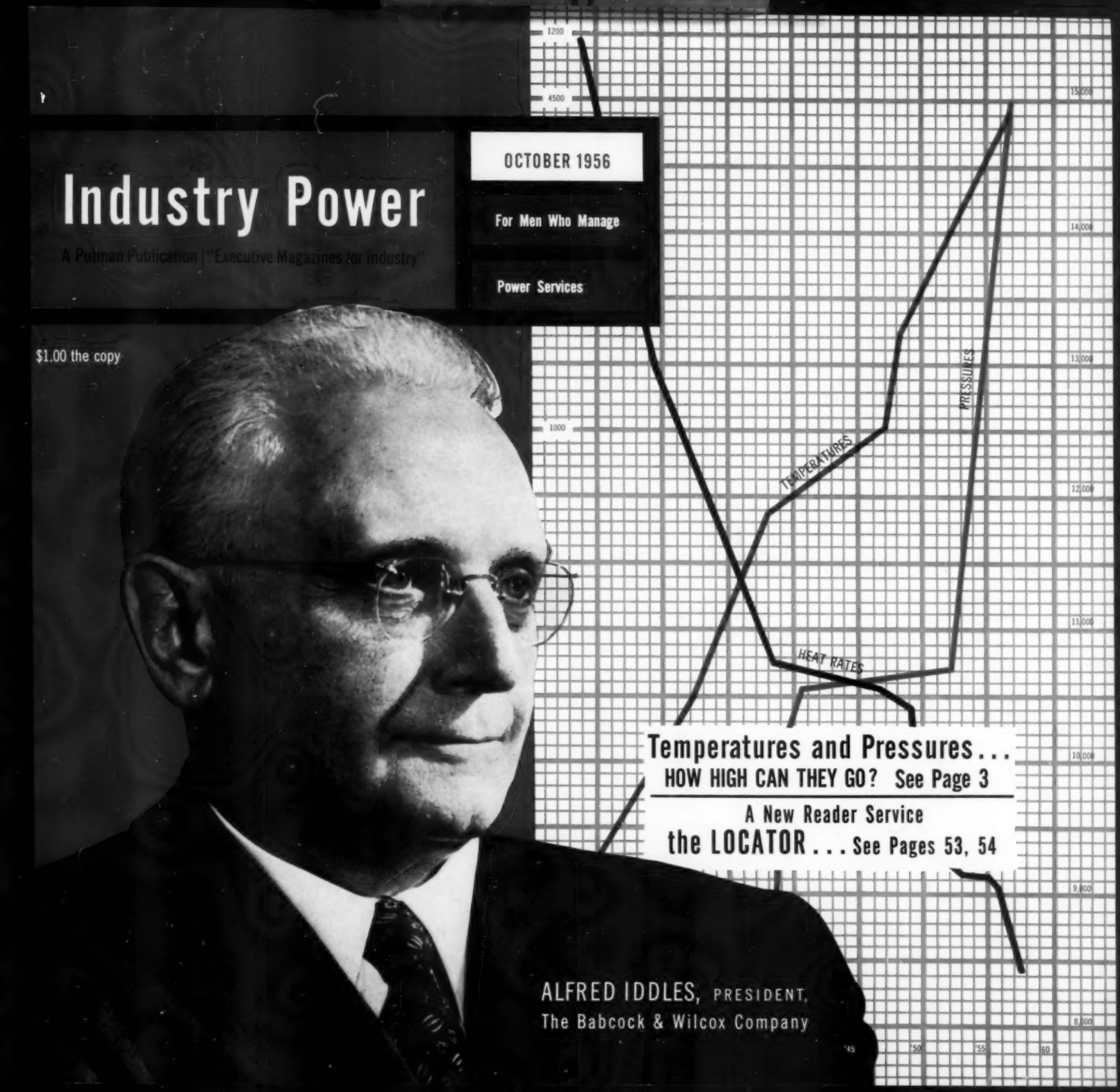

Temperatures and Pressures...

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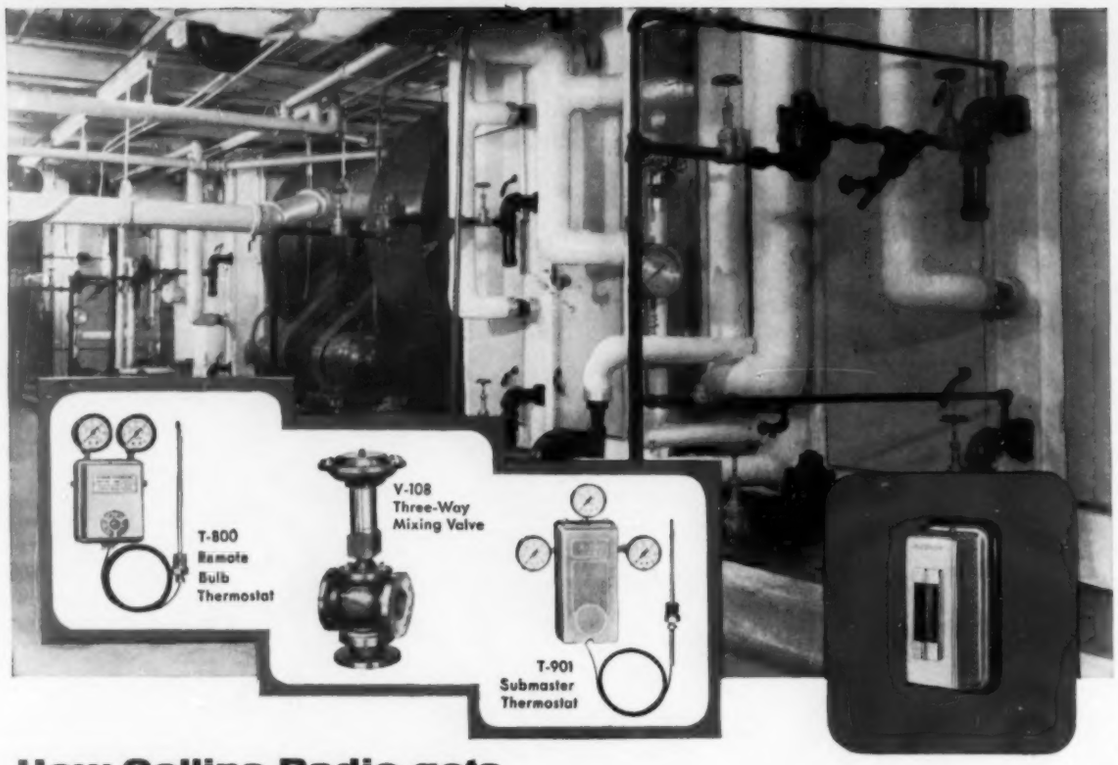
ALFRED IDDLES, PRESIDENT,
The Babcock & Wilcox Company



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*Engineering and Research Building, Collins Radio Company, Cedar Rapids, Iowa. Abell-Howe Company, architects & builders, Chicago; Samuel R. Lewis & Associates, mechanical engineers, Chicago; J. W. Darrogh, Inc., mechanical contractor, Cedar Rapids.

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Industry Power Forum

About Alfred Iddles

Alfred Iddles has been associated with Babcock & Wilcox since 1937. He was made a vice president in 1945, a director in 1947, and president in 1948. He is also a director of Bailey Meter Company, The Lummus Company, Babcock-Wilcox & Goldie-McCulloch, Ltd. of Canada, and Babcock & Wilcox, Ltd. of England.

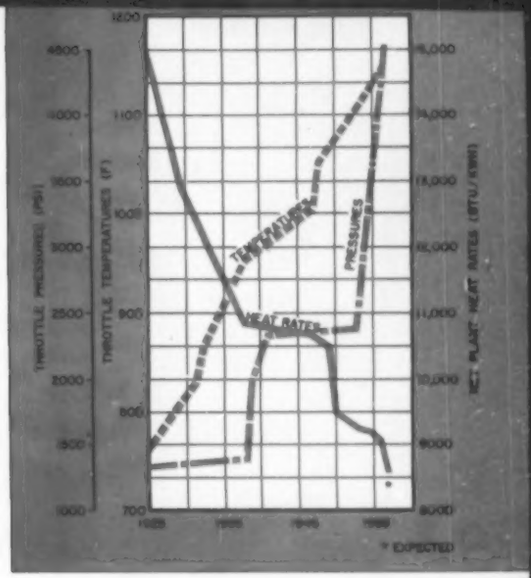
Before joining Babcock & Wilcox, Iddles was a vice president of United Engineers & Constructors in charge of design and construction work throughout the United States, Canada, and South America. Prior to that, he was a vice president of Day & Zimmerman Engineering & Construction Company. He was associated with a large amount of public utility work for United Gas Improvement Company and its associated companies. He was chairman of the Prime Movers Committee of the old National Electric Light Association in 1932. Iddles has spent most of his life in design, construction, and operation of power plants.

He was born in Casco, Mich. on December 1, 1889. He graduated from Michigan State College, Lansing with a bachelor of science degree in 1912 and later acquired a mechanical engineering degree. He holds honorary degrees of Doctor of Engineering from Brooklyn Polytechnic Institute, Michigan State College, and New York University.

During World War I, Iddles was an Army captain in charge of power plants for the gas plant at Edgewood (Maryland) Arsenal. In 1919 he was affiliated with the Fuels Division of the Bureau of Mines in Pittsburgh, Pennsylvania.

He is a Fellow and past vice president of ASME, a member of the Franklin Institute, and vice president of the Atomic Industrial Forum.

Temperatures and Pressures . . . How high can they go?



ALFRED IDDLES, President
The Babcock & Wilcox Company,
with HAROLD A. BERGEN, Editor

WHETHER AN ENGINEER wants to utilize heat from fossil fuels or atomic reactors, he finds that steam is the basic medium of energy transfer. Because the demand for energy is growing rapidly while fossil fuel supplies are increasing in cost, the engineer has a strong economic urge to increase efficiency of fuel utilization.

While in many applications cost of fuel for industrial use is not a large item in the overall cost of production, the upward trend of fuel costs makes it increasingly desirable to improve efficiency of steam generating equipment. More and more industrial plants are using air heaters, economizers, and highly efficient fuel burning equipment. Steam pressures and temperatures in industrial plants are still trending upward.

Need for maximum efficiency occurs in the electrical power industry where the commodity being manufactured for sale *is* energy. This industry has, therefore, been the leader in the drive for higher pressures, temperatures, and efficiencies, and has reduced the heat required to produce a kilowatt hour to very low levels.

This improvement in overall plant performance has not resulted solely from the use of higher pressures and temperatures. Improved fuel burning techniques, more efficient boiler designs, greater use of the reheat cycle, and greater efficiency of auxiliary equipment and of the turbogenerator itself, have also contributed.

It is natural now to ask if higher levels of efficiency can be obtained and, if so, by what means. It must be borne in mind, of course, that no advance can be declared advantageous without determining the cost of securing it. These costs must be balanced against the operating savings over the economic life of the unit. Efficiencies of 90 to 91 percent are not unusual for coal-burning units today. Not much of the difference between 90 and 100 percent is recoverable under present conditions. Inherent heat losses might be reduced by using more heat reclaiming surface in the air heater and economizer, but we must be sure the savings would more than balance the increased cost of equipment and maintenance. This is difficult to do under today's conditions.

There is, however, a continuing search for materials that will permit lower stack temperatures and higher boiler efficiencies. As fuel costs increase in the future and as metallurgy and design knowledge improve, we may expect some small move in the direction of boiler efficiencies nearer to the theoretical maximum.

One of the most attractive savings in overall power costs presently resides in the improved cycle efficiency obtainable by using higher temperatures and pressures combined with reheat. The Universal Pressure unit operating at supercritical pressure at the Philo Station of the American Gas & Electric system will establish new frontiers in the realm of higher pressures and temperatures. Experience with this unit — which will operate at 4500 psi, 1150 F, with two stages of reheat to 1050 F and 1000 F — will be especially important in providing lessons in steam generation and utilization in steam turbines.

Next probable step in the direction of higher pressures and temperatures will be to increase steam temperature to 1200 F, and to continue with multiple reheat—with supercritical pressures in the range of 3500 to 4500 psi. Pressures above 4500 psi could be used, but there is a desirable relationship between steam pressure and steam temperature. Immediate problem is to obtain new economic alloys that would

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make possible plants that will have heat rates of 8000 Btu/kwh or slightly better.

Combined gas-turbine, steam-turbine cycle offers distinct advantages. Such a cycle will require that boilers operate with pressure-combustion conditions in the neighborhood of 75 to 100 psi. To utilize this cycle burning coal and oil—basic fuels in the United States—will require better ash removal from the products of combustion so that they may be acceptable to the gas turbine. Intensive research and development work in this area is under way.

An almost unlimited supply of heat is available from atomic fission under controlled conditions. So far, the energy transfer medium is steam for a turbogenerator. Obviously, the basic problem is the same as in the conventional power plant: Heat must be produced efficiently and used to produce steam at the highest practical pressure and temperature. Two big problems today are, first, to develop equipment with a low initial cost and with acceptable maintenance, and, second, to determine the actual commercial cost of nuclear fuel (which involves the production of fissionable material and reprocessing costs to maintain that fuel in usable condition).

To produce power by fission of the atom in competition with fossil fuel, we should expect a long and difficult development period. We must produce the fissionable material at lower and lower costs and then build the equipment to produce and use the heat with simpler designs and lower cost of manufacture. These developments must be continuously compared with conventional plants and the probable increase in cost of fossil fuels for them.

Courage of utility managements and their determination to build more economical plants promises a continuing advancement in the field. Both utility and industrial engineers assume that new plants need not be exact duplicates of the last ones, if developments have indicated a reasonable improvement is possible.

Natural outgrowth of this attitude has led to what I believe is the most important single factor in this rapid progress in the efficient production of electrical energy. I refer to what I believe is a rather characteristic American habit—more prevalent here than anywhere else in the world—and that is the close cooperation that exists between the users and the manufacturers of equipment. Each group recognizes that if it wishes to build something new, which has a promise of improvement over the last job, some troubles must be expected. Both maker and user must unite and work out a means of correction and each must share in the cost. Obviously, this speeds up development of improved equipment and each party profits.

I am confident that with this attitude we can show further improvement in plant performance and also be prepared to meet the problems that will someday confront us in shifting over from fossil fuel to atomic energy. ♦ ♦

A PUTMAN PUBLICATION

Industry Power

For men who manage power services

VOLUME 71 NO. 5 OCTOBER 1956

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Read how a large Michigan steel mill uses waste blast furnace gases with auxiliary oil firing to provide steam at a wide range of pressures for electric generation and process use.

build lightweight aluminum bus 14
Here's how Ethyl Corp. engineers designed and built their own lightweight 30,000-ampere aluminum bus—and why. Now they have high conductivity with structural stability.

inplant testing for your boiler water 16
Water treatment without control is worthless . . . . but what to test, how often, and how? Inplant testing is the most economical way, and the surest way, too. Find out how you can gain.

smoke abatement with half the maintenance 18
Alhambra Foundry Co. Ltd. tackled their serious smoke abatement problem from a different angle, and find they have an effective system that saves 50 percent on maintenance.

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III—mixtures of gases, gases and vapors; psychrometrics. Covers basic definitions and gives useful examples with their solutions.

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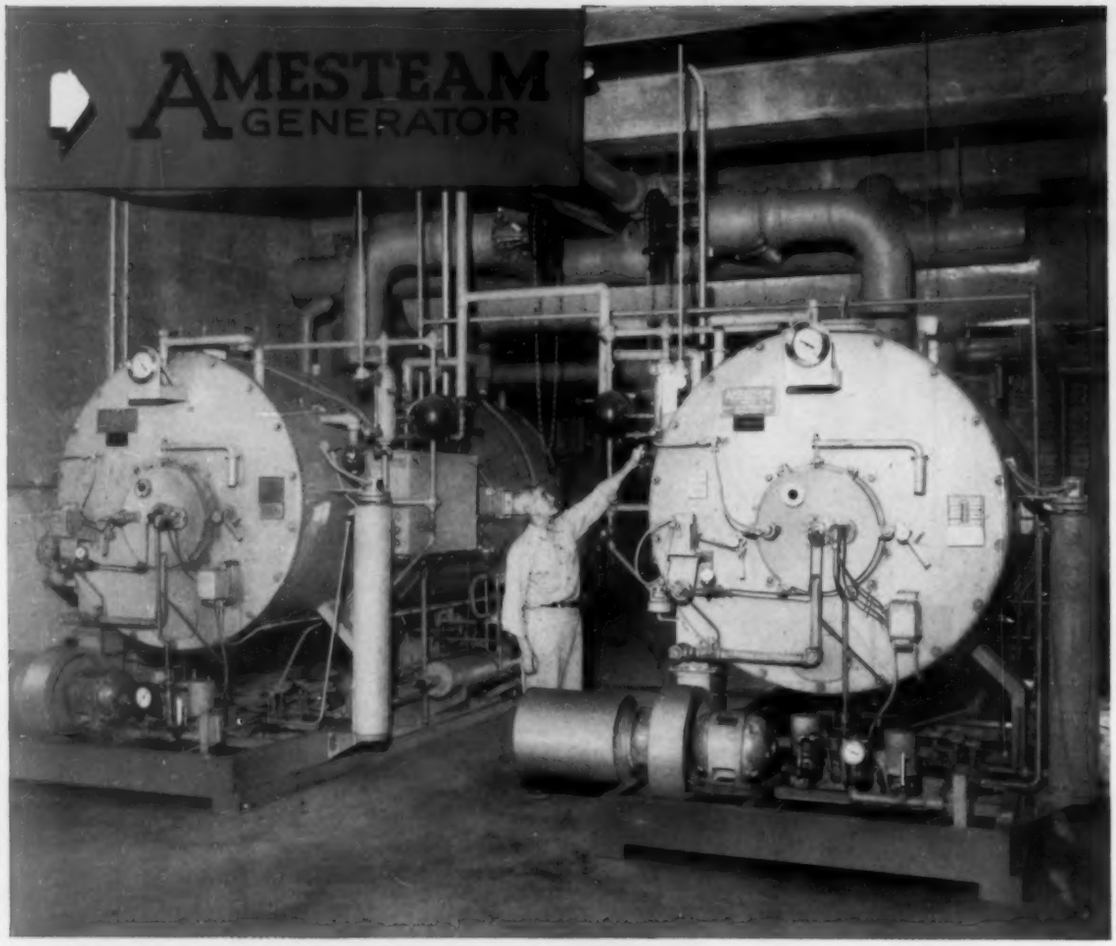

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nuclear news

. . . about industry power

20 PERCENT IN 20 YEARS

Latest estimates by the AEC show that nearly 20 percent of total installed electric power generating capacity in the United States will be nuclear by 1975. This means a total of 80-million-kw capacity in nuclear plants. AEC feels that perhaps within 10 to 15 years nuclear power plants will be competitive in cost with the most modern conventional plants.

MASS-PRODUCED REACTORS TO LAST 300 YEARS

Mass production is beginning on a small, portable, self-contained nuclear reactor. Critical mass of fissionable material is less than in any known reactor. Core construction locks in fission products, eliminating waste disposal problems and preventing escape of radioactive contaminants. Normal core life should exceed 300 years. Reactors can be installed in an ordinary room for training reactor engineers and operators.

ISOTOPE USE INCREASES 500 PERCENT

Industrial users of radioactive isotopes have increased in number by more than 500 percent over the past five years, according to a survey just released by the Atomic Industrial Forum. More than 1000 organizations are now using atomic energy byproduct materials in 1347 different installations.

SUBMARINE REACTOR COMPLETES LONG RUN

Longest full-power run ever completed by any type of propulsion plant -- land, sea, or air — was completed by the nation's first practical reactor power plant. It ran for 66 days and nights. This reactor, land-based prototype for the submarine Nautilus, provided 1600 hour's continuous operation without fuel recharge, equivalent of diesel-powered submarine operation consuming 1.6 million gallons of oil . . . . AEC has approved construction of new prototype reactor plant to power a small sub-

marine. A $10 million contract has been awarded Combustion Engineering for the work.

RAISE REACTOR DEVELOPMENT BUDGET

In the Congressional appropriation granted the AEC for the fiscal year 1957, the dollar allotment for reactor development operations was raised from the previous year's $172 million to $285 million. $53.2 million of the $285 million is earmarked for reactor developments for "civilian power." A significant allotment, some $30 million, is allotted to a "power reactor acceleration program." AEC explains, in part, that "it has now become apparent to the Commission that with the investment of additional funds it will be possible to accelerate work on several of the most promising reactor concepts for economical nuclear power."

UNIQUE NUCLEAR POWER FOR ALASKA

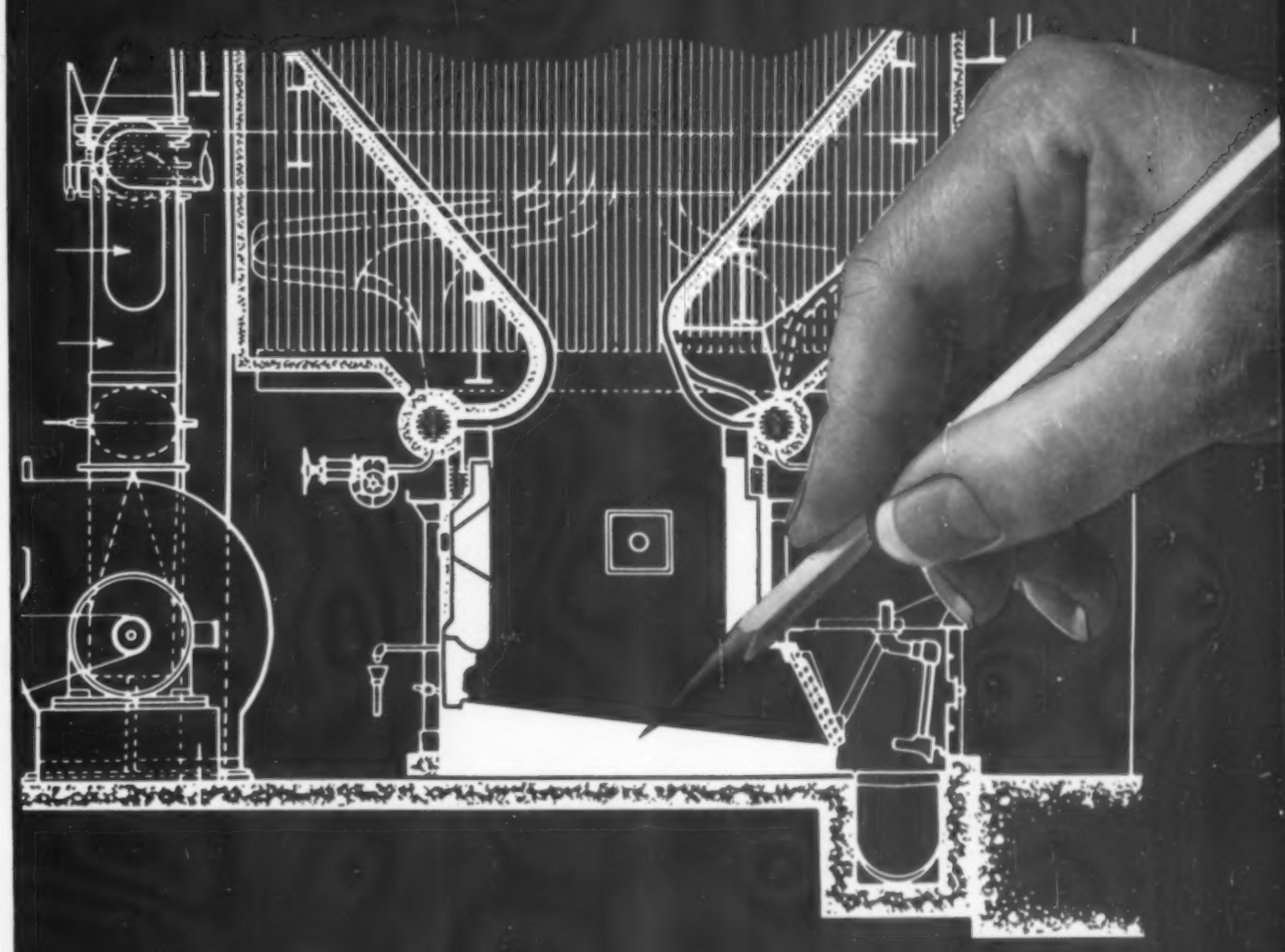
Negotiation has been approved by the AEC for a contract covering limited initial design and development work on a unique nuclear power system combining heavy water as a moderator with liquid sodium as a coolant. This combination constitutes a technical advance of sufficient importance to merit research and development at this time. Reactor will be built by Nuclear Development Corporation of America and Chugach Electric Association of Anchorage, Alaska. Electrical capability will be 10,000 kw. ♦♦

a new reader service . . . .

the LOCATOR

Turn to page 53 and you'll find a complete listing of all advertisers and the local offices they have ready to serve you. Information in a hurry is yours with INDUSTRY POWER's new LOCATOR . . . see page 53

How to draw the line on ashpit maintenance



"Let's put Kaocrete here"

Relining ashpits is expensive and time-consuming. That's why more and more utilities and industrial companies are specifying a heavy-duty refractory castable such as B&W Kaocrete D. On job after job, it has withstood the heavy abrasive or erosive attack of sprays, jets, rakes or shovels.

The reason? Specially designed Kaocrete D has the strength and hardness needed for tough ashpit service. It has unusually high resistance to abrasion, erosion and spalling. It saves time because it can be poured or gunned into place. For less severe abrasive or erosive conditions, B&W recommends Kaocrete A.

Get the facts and figures on these B&W Refractory Castables from your local B&W Refractories Engineer.

Send for Bulletin R-36 which gives data on B&W's wide line of specialized boiler refractories.

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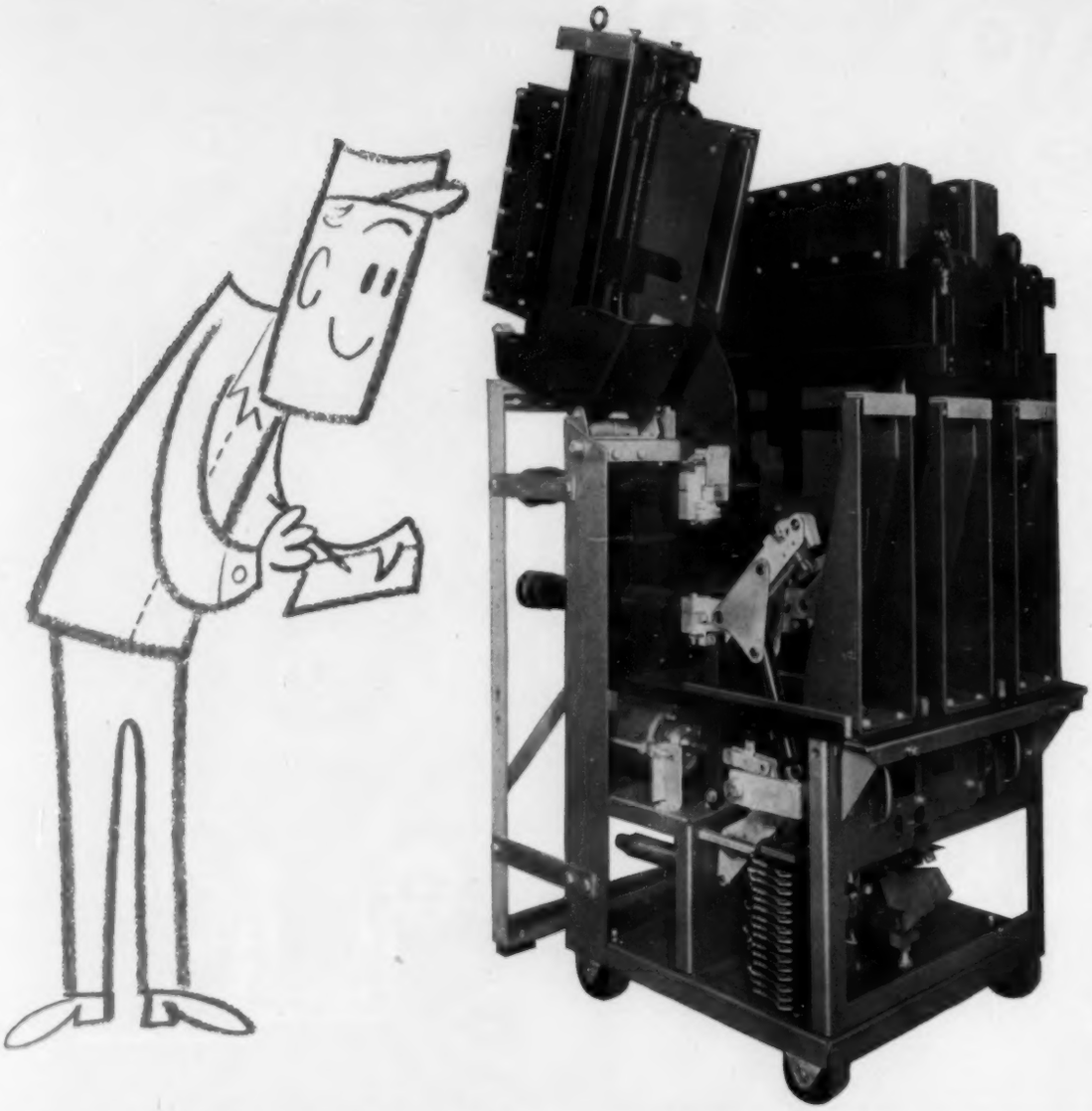

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Operating engineers in the electrical industry often say you can see the higher quality in I-T-E switchgear even when you stand 'way back.

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late news

. . . about industry power

• All-aluminum engine comes closer

Aluminum Company of America, cooperating with Metallizing Engineering Company, Inc., brings development of America's first practical all-aluminum engine one step nearer. A highly wear-resistant coating of sprayed steel on aluminum cylinder walls is responsible. After full tests, serviceability of both aluminum pistons and steel-sprayed aluminum cylinder surfaces have proved themselves superior to similar components in a conventional engine. Process eliminates need for special slotted pistons or pistons fitted with expansion control devices.

• Aluminum pressure vessels come closer

Kaiser Aluminum & Chemical Corporation is granted permission by ASME to use aluminum alloy 5086 for fabrication of unfired pressure vessels. This alloy is the highest strength aluminum alloy permitted thus far by ASME for welded construction. It takes advantage of inert-gas, shielded-arc welding methods and has excellent welding characteristics. Alloy 5086 provides an 18-percent design advantage over the next highest strength alloy.

• Automation comes to air pollution

United States Steel Corporation awards order to Western Precipitation for the largest system ever designed for control of open hearth dust and fumes. Dust from eleven furnaces at Homestead Works will be collected in a main flue system and conducted to central gas cleaning stations. These stations will contain latest in electrostatic precipitators. A central remote control station will provide pushbutton control of gas flow and dust removal.

• Next month's Power Show still growing

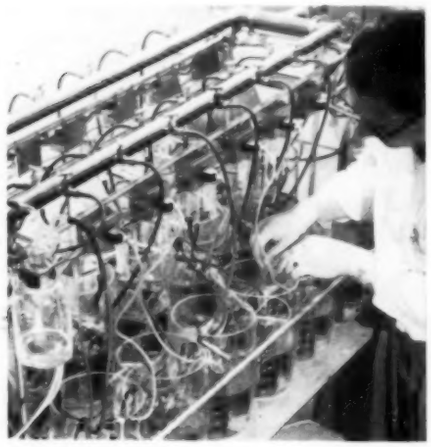
Additional sections of display have widened the scope of the 22nd Power Show, to be held in the New York Coliseum next month. Preparations for the array of 300 or more exhibits are well under way — 50 more than were anticipated last month.

• World's largest generating unit

New $58 million electric power plant, to house the world's largest generating unit, will be built by the Indiana & Michigan Electric Company near Terre Haute, Ind. Power plant will be served by a new nearby coal mine to be developed by Ayrshire Collieries Corporation, of Indianapolis. Mine and power station will be connected by a private six-mile railroad. Generating unit will have a capacity of 450,000 kw — 73 percent larger than any unit operating today. It is the first of two planned by American Gas and Electric Company System, of which I & M is a major part. Construction will be started in the very near future and completion is scheduled for late 1958. Provision in its design has been made for eventual expansion to 900,000 kw. Plant is expected to show a 5-percent improvement in thermal efficiency over world's best to date.

• Electricity from gases

A battery, called a fuel cell, is being developed to produce electricity from such gases as hydrogen and oxygen. At research laboratories of National Carbon Company, a division of Union Carbide and Carbon Corporation, gases flow through tubes into



beakers where carbon plates are immersed in special fluids. Small amount of electricity extracted from gases in cells will light a small bulb. When ultimately developed, commercial fuel cells may be used for reserve or standby power supplies.

• Fly ash in cement

Pilot scale tests at Allis-Chalmers Manufacturing Company show that fly ash can be substituted for shale or clay in the raw material from which modern portland cement is made. The Wisconsin Electric Power Co. is planning to supply about 50,000 tons per year of fly ash to the first unit of Marquette Cement Company's new Milwaukee plant. About 15 to 16 percent of Marquette's raw material will be made up of fly ash used as a substitute for shale.

• Reorganizes steam division

Westinghouse Electric Corporation has reorganized its steam division at Lester, Pa., to keep pace with expanding sales. Realignment has resulted in establishing four product operating departments — heat transfer apparatus department, small turbine department, large turbine department, and industrial gas turbine department.

Pardon the omission

The name of H. K. Ferguson Company was inadvertently omitted from the story on the Bridgeport Brass Company project reported in our June issue. H. K. Ferguson was retained as consulting engineers on the project. We are sorry for this oversight.

In water conditioning... the tough jobs go to

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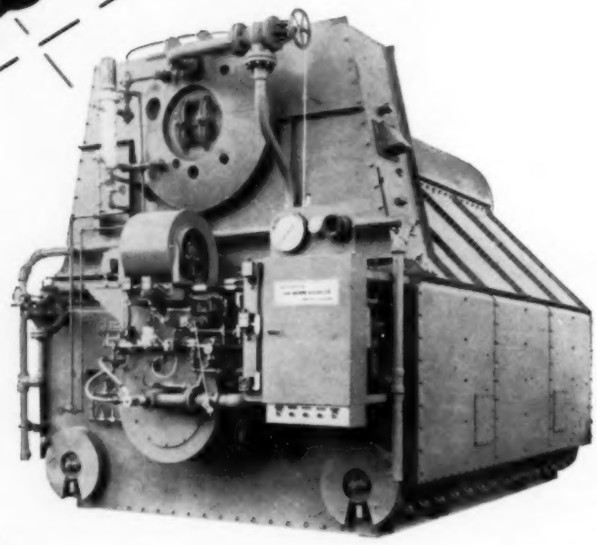

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this month's comment . . . .

another service for our readers

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On pages 53 and 54 you will find every manufacturer listed who advertises in this issue. Under the company name, listed alphabetically by city, are the names and addresses of that company's branch offices or representatives in your area. Where a company prefers to have you get in contact with its factory, only the home office address is given.

Thus, if you read about an advertised product in this issue and want more data and information about it right away — just turn to pages 53 and 54 for the location of the "Sales and Service Office" nearest you.

Frankly — this new reader service is an experiment.

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John Paul Taylor

John Paul Taylor
Editor and Publisher

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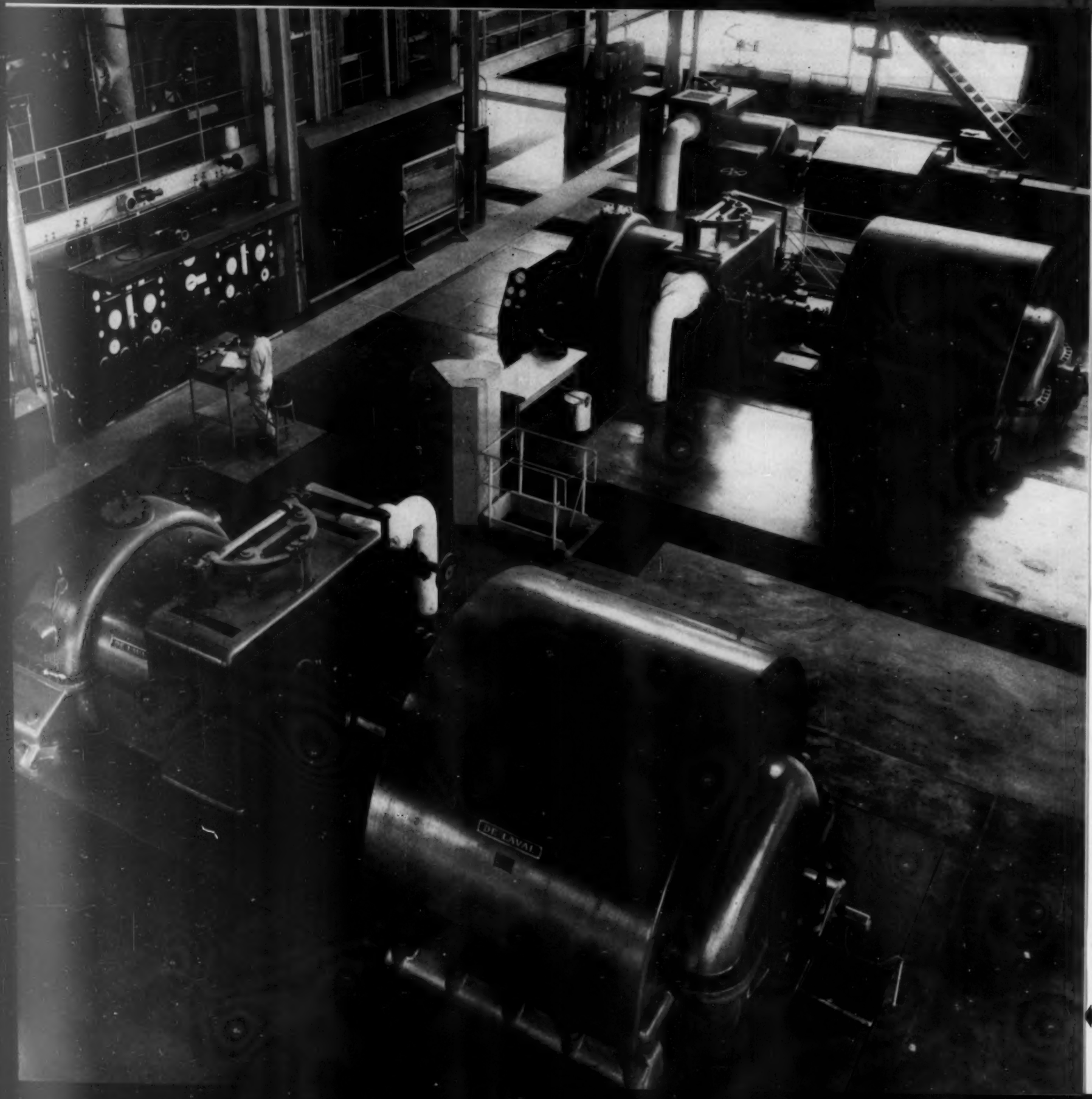

DE LAVAL

Pressure-reducing valves and well-planned engineering provide auxiliary steam at well-coordinated temperatures and pressures. This is how

McLouth Steel parlays powerhouse steam

GEORGE F. WOLFE
Chief Project Engineer
Dravo Corporation

with R. W. DE MOSS
Assistant Editor

HEAT CONTENT IS SQUEEZED out, literally, of waste blast furnace gases at McLouth Steel Corporation, Trenton, Michigan. Well thought-out installation gets good mileage out of all powerhouse steam at an unusual array of temperatures and pressures for a 4000-kw turbogenerator plus all auxiliary mill requirements.

Boilerhouse and blower building is a two-story steel-frame, pile-supported structure approximately 135 by 135 feet. A wing, 20 by 80 feet, houses switchgear and a 1000 cfm air compressor. Reinforced concrete second floor is supported on steel framing with all upper platforms of Tri-Lok gratings. Building is covered with corrugated asbestos-protected metal and has continuous louvers for roof ventilation.

Boilers, turboblowers and turbogenerator are mounted on the second floor, 24 feet above the ground floor. Boilers are supported on steel building framework. Turboblowers and turbogenerator are carried on independent pile-supported reinforced concrete foundations brought up to second floor level. All auxiliary equipment is on the ground floor with exception of forced-draft fans. This arrangement eliminates conflict between major equipment installation on second floor and auxiliaries and piping under the second floor.

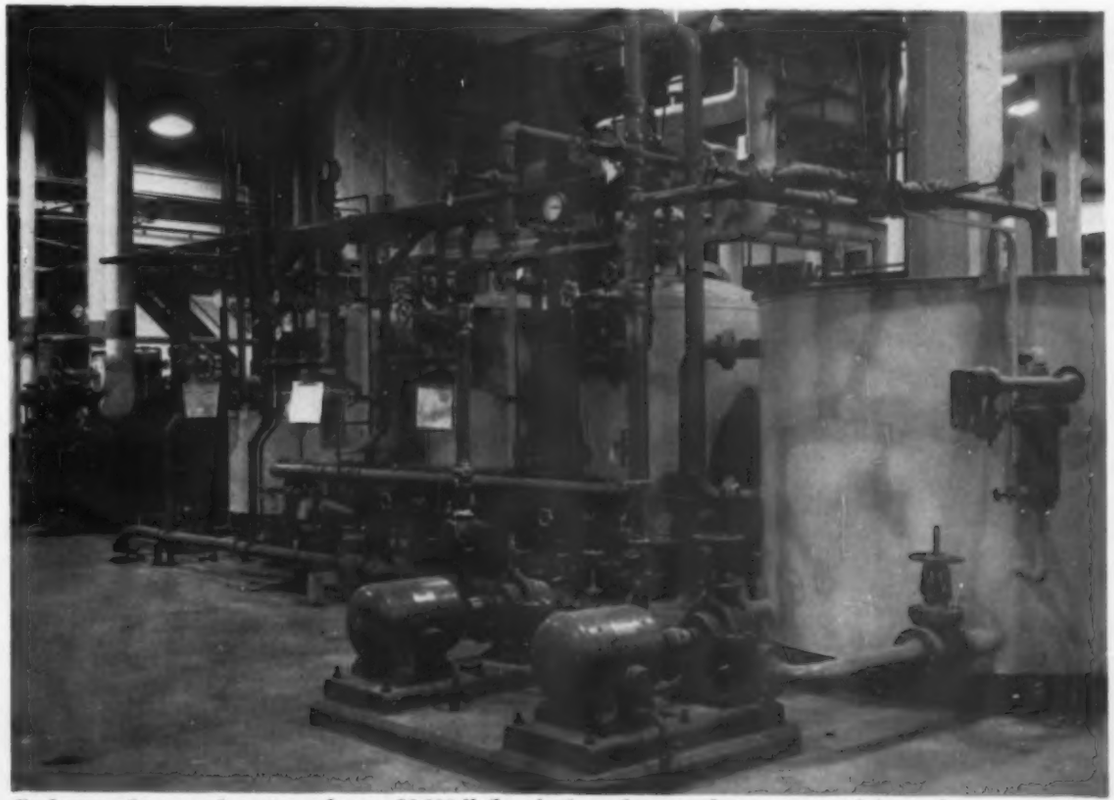
On boilerhouse side of the building, the second floor is extended as an outside paved platform to support hot lime softeners and deaerating feed-water heater. At the opposite side of the building, a steel-plated platform goes out at the same level to support turboblower air intakes and discharge lines. This arrangement provides ready access to most main equipment on one floor level. Access doors to the outdoor platform also serve as emergency exits in case of boilerhouse gas leakage.

Steam demands at the new steel plant normally require two boilers, each with a capacity of 120,000 lbs/hr. To insure quick standby or auxiliary steam, however, three boilers are provided. (Extra steam is available more quickly from a boiler under fire than a cold boiler. So we get our normal 240,000 lb/hr load by drawing 80,000 lb/hr from 3 boilers in preference to drawing 120,000 lb/hr from two boilers with one remaining cold.)

Each boiler is designed for normal operation at 120,000 lbs/hr, 625 psig, and 825 F at superheater outlet. Boilers are two-drum, water-tube type fired with blast furnace gas, oil, or a combination of the two fuels. In accordance with standard safety practices, these boilers were furnished with welded steel casings to prevent gas leakage. Preliminary estimated steam requirement (240,000 lbs/hr) was verified after operating several months.

Combustion control system operates on boilers

(continues on page 24)



Cochrane oil removal system salvages 28,000 lb/hr of oil condensate that is returned from the oxygen plant.

Two DeLaval turboblowers, each rated at 110,000 cfm of air at 30 psi, supply air for blast furnaces.

How Ethyl Corp. engineers designed and built their own

Lightweight, 30,000-ampere aluminum bus

E. H. COXE
Supervisor, Rectifier Substations
Ethyl Corporation

with R. W. DE MOSS
Assistant Editor

ALUMINUM BUS, designed and built by Ethyl Corporation's engineers affords high conductivity with structural stability at an economic price.

Aluminum bus installation was originally designed to carry 10,000 amperes, using two 10-inch by ½-inch No. 2 EC-T6 alloy channels in box formation for each conductor. When we found it necessary to transfer 30,000 dc amperes at 550 volts from one rectifier station to another, a circuit distance of 700 feet, the design was modified. New design included addition of seven ¾-inch by 10-inch rectangular aluminum bars of EC-H112 alloy between each pair of channels.

We considered several types of conductor in making first bus: copper cable, rigid copper bus bar, aluminum cable, suspended aluminum bus bar, and rigid aluminum bus bar. Since aluminum has conductivity about 62 percent that of standard annealed copper, aluminum bus cross section must be roughly 50 percent greater than copper for equal conductivity. Aluminum density is 30 percent that of copper, so the weight per unit length is (1.5) (0.3) or 45 percent that of copper with the same conductivity. With aluminum costing less per pound than copper, the economy is obvious. Cost of supporting structures is also reduced by the lighter weight.

Among the aluminum alloy channels we considered were EC-H112 (with 12,000-psi tensile strength and 8000-psi yield point) and 2EC-T6 (with 29,000-psi tensile strength and 25,000-psi yield point). Electrical conductivities of these alloys are 61 percent and 55 percent minimum, respectively, based on conductivity of standard annealed copper.

Channels were built for back-to-back mounting to accommodate 30,000-ampere load. Two alloys were used because channels had sufficient strength for the spans contemplated and because bars of EC-H112 were available on shorter delivery than bars of 2 EC-T6 alloy. A slight conductivity and price advantage was gained in using this combination of alloys. By using channels made of 55-percent conductivity alloy, and bars made of 61-percent conductivity alloy, the combination increased average conductivity over an all-channel bus. Price advantage was due to lower unit price for the bar alloy.

This bus assembly was calculated to have a conductivity of 30,700 amperes unpainted and 33,200 amperes painted with an air-drying black alkyd enamel. Conductivity increase is due to greater emissivity of the painted surface. Buses were spray painted by our own Ethyl Corporation construction crews. Ratings are based on 30 C rise over 40 C ambient. If allowed to go to 90 C, an additional 1800 amperes could be carried.

Our new bus has a number of unique structural features. There are no insulators between polarities.

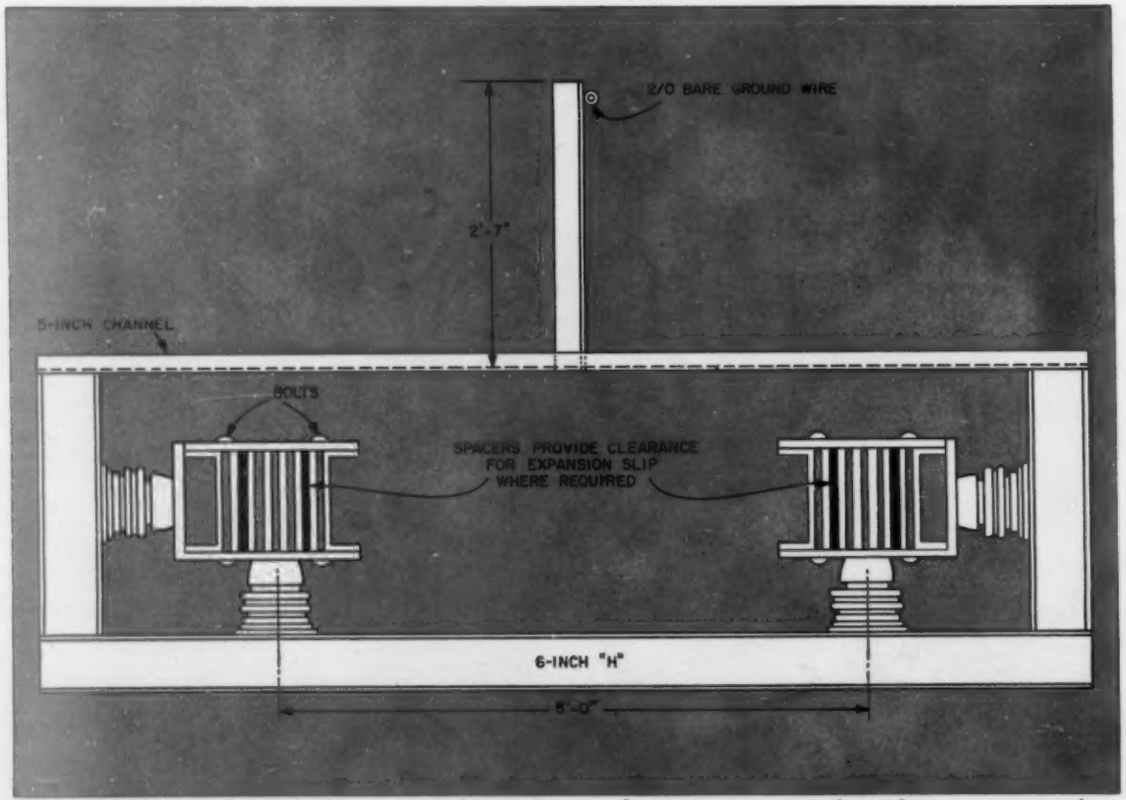


Fig. 1—Welded structural-steel bus support has 30,000-pound compressive strength insulators supporting bus.

Insulators, at bottom and sides of bus, support vertical load and brace against forces of short circuits.

Each support point consists of a welded steel-channel rectangle (Fig. 1) with both buses inside the rectangle. Insulators are placed under the bus to carry the vertical load and are placed between bus and side channels to brace against short-circuit forces. Insulators have a compressive strength of 30,000 pounds and a cantilever strength of 4000 pounds at 2½ inches. Maximum short-circuit current is calculated as 250,000 amperes. Circuit breaker clearing time is approximately one cycle. This clearing time was considered in designing the bus bracing. We doubt whether the bracing is adequate for a sustained short circuit of the magnitude possible.

Bus conductor was received in 30-foot lengths and was installed with a maximum span of 22 feet. All rigid joints are welded. Each continuous installed length has support clamps tight at only one location. Other clamps have slight clearance to permit slippage under expansion and contraction. All nonrigid connection points have sheet copper flexibles. Copper is used because of space and corrosion considerations. Sheet was used in lieu of braid for the same reasons. Everdur bolts and generous quantities of Grade A Special No-ox-ide grease are used at all bolted connections.

shielded arc gives better welds

A consumable electrode machine was used for aluminum welding with 1/16-inch welding wire of No. 4043 alloy on 10-pound spools. Arc was shielded by argon gas. This method was recommended as being faster and superior in its ability to weld joints in all positions. Bus ends to be welded were beveled to a 30-degree angle with normal, thus providing 60 degrees of weld. Surfaces to be welded were washed with chemical solvent and then wire brushed thoroughly.

Four-inch by ¾-inch aluminum spacer blocks are welded between bus components of the same polarity to provide ventilating ducts and to bind the assembly into a rigid beam. Beams were assembled on the ground into the maximum lengths that could be handled by a crane. This permitted most of the welding to be done on the ground. Space limitations would not permit welding two ground-assembled sections together in their permanent location. A short section had to be assembled and welded in

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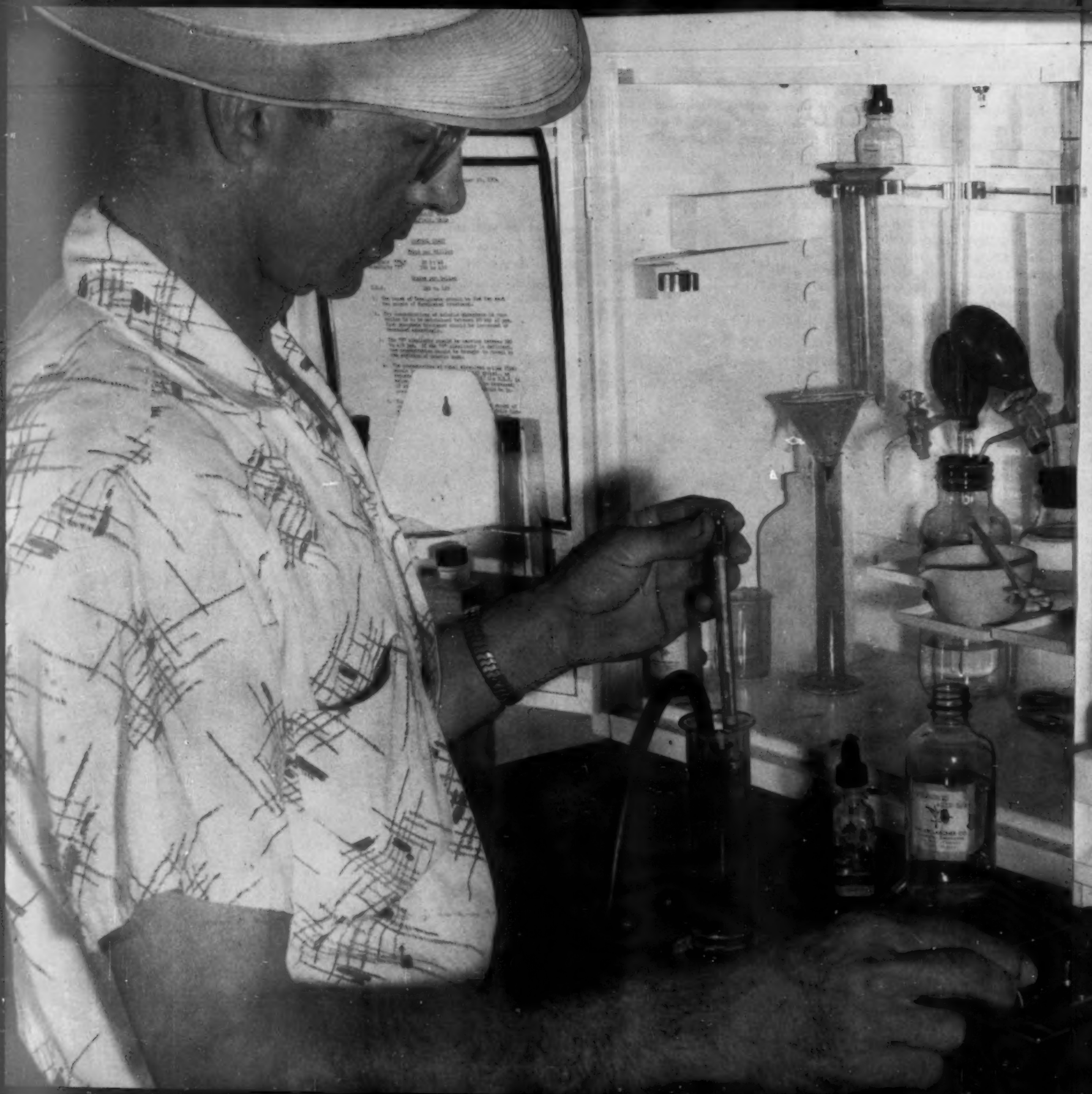
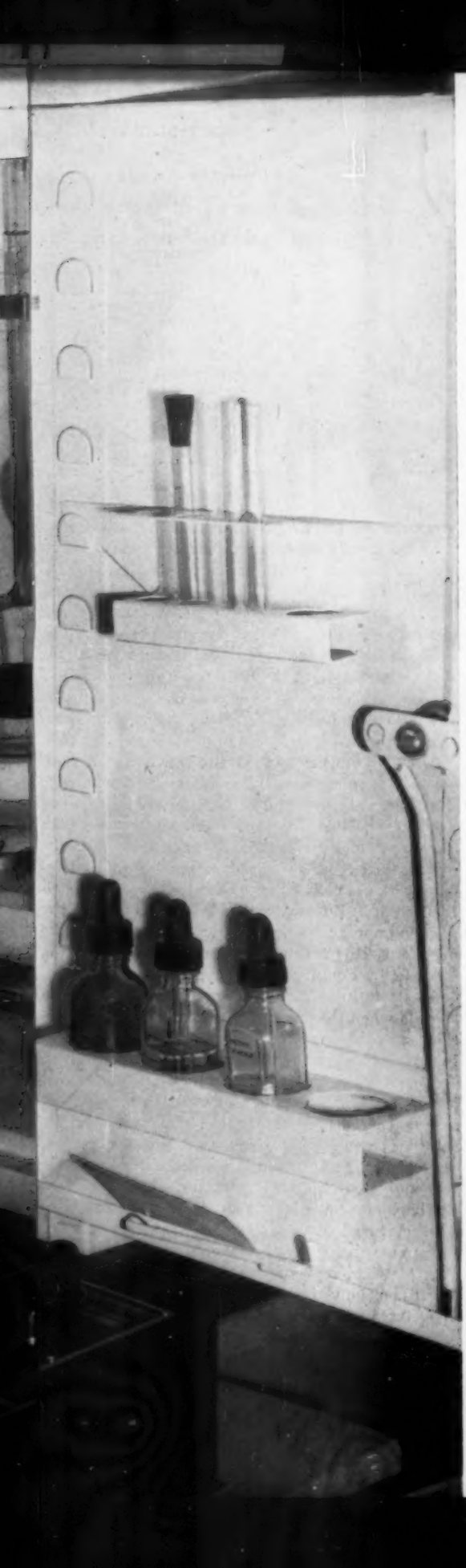




Why U. S. Gypsum Co., Willys Motors Inc., Springfield (Ohio) City Hospital, and the Ohio Masonic Home (Springfield) all believe in

INPLANT TESTING for *your* boiler WATER

J. L. THORNLEY
Chief Chemist
The Bird Archer Company

with DONALD HARTLEY
Managing Editor

EXPERIENCE OF U. S. Gypsum Co., Willys Motors Inc., Springfield (Ohio) City Hospital, and the Ohio Masonic Home (Springfield) shows that effective boiler feed-water treatment demands effective control . . . . And a good inplant test and control program is essential. These managements have found that if control is not maintained, then the treatment program might just as well be abandoned. Insufficient treatment is as bad as no treatment at all. Excess treatment can be as objectionable as the quality that originally needed correction.

Inplant, on-the-spot testing programs offer many advantages for all who treat boiler feed-water:

- Test results are instantly at hand. Adjustments in treatment dosages can be made as soon as tests are complete. No time lag intervenes between testing and reporting results.
- Proper treatment-feeding schedules can be maintained continuously. Periods of undertreatment can be eliminated, thus assuring maximum benefit. Periods of over-treatment can be eliminated, thus assuring maximum operating economy.
- Test program cost is less because the necessarily higher testing costs with outside laboratories are avoided.
- Inplant testing quickly warns of nonconformity with expected results. Treatment formulas can be changed quickly if raw water quality changes.

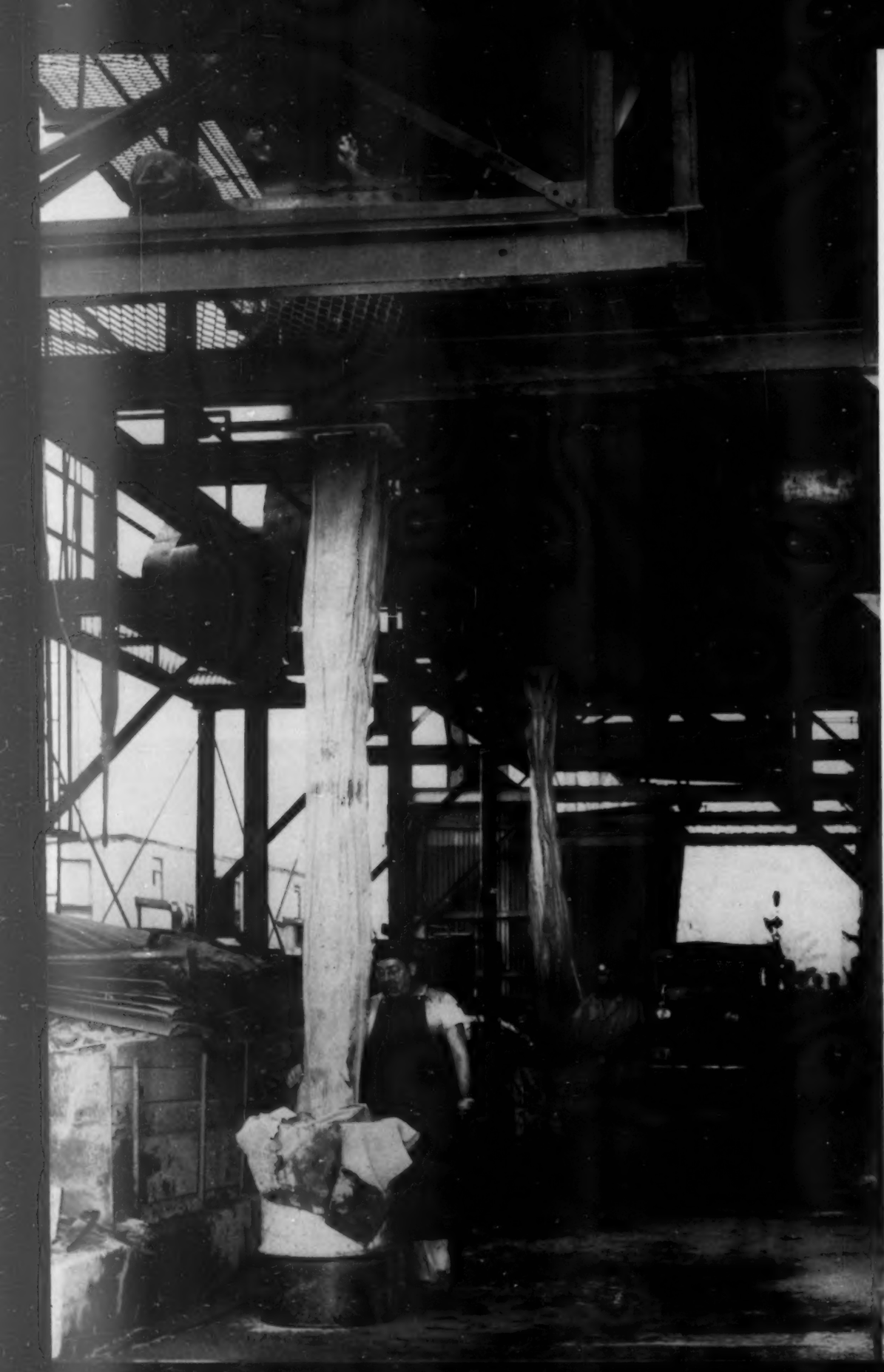
Your inplant testing program should be set up under direction of your plant chemist or under the supervision of a water treatment laboratory. Test equipment and reagents should be purchased and a suitable work area specifically set aside for the purpose. Assign responsibility for testing to one man.

Be sure the water tester has sufficient time allotted for making all tests. Experience shows that a boiler operator who maintains proper treatment con-

(continues on page 29)

M. A. Gaither at Springfield City Hospital checks chromate content in cooling water with comparitor.

Boiler operator Fyffe at Ohio Masonic Home adjusts for temperature in test for total dissolved solids.



By using dry-bag smoke collectors in place of wet-bag collectors, we at Alhambra Foundry are meeting smoke regulations and . . . .

WE CUT MAINTENANCE in half by using a dry-bag smoke collector instead of a wet-bag system at Alhambra (Calif.) Foundry Co. Ltd. Our annual maintenance bill is only $1200, compared with the $2400 we would have to spend on wet baghouse maintenance. Both systems require periodic refinishing, emptying, and bag replacement. But our maintenance is cut in half by using dry-bag collectors because there are no water cooling facilities to look after. And our unit meets rigid smoke abatement requirements in force in the Los Angeles area.

Although our dry baghouse unit may be susceptible to some refinement, it is neither new nor untried. Unit is classified as "dry" because it has none of the water-cooling accessories commonly used with filter-type smoke collectors. A series of radiant air-cooling flues is used, instead, to reduce smoke temperatures. Flue efficiency is such that gases are cooled from 2000 F to under 430 F before entering the silicone-impregnated glass fabric retainers in the baghouse. This temperature assures long bag life.

Alhambra Fountry was among the first to come under the scrutiny of Los Angeles County air pollution officials when they were organized in 1948. We decided to tackle smog control from a different angle. Research clearly indicated that we had to use baghouse equipment, and wet baghouse equipment had proved its worth elsewhere. But we weren't at all sure that wet-bag filters would indefinitely meet air pollution regulations, which seemed to be getting more rigorous all the time. We had developed dry-bag equipment that was operationally superior to wet baghouse units for a time. Wet-bag filters have been improved since our first dry-bag development, and are now being used by other gray iron foundries. They are as effective as our dry-bag equipment, but we still have a maintenance advantage.

We use basic smoke collection flues that we pro-

Baghouse is cleaned out regularly once each week, on Saturdays. About 550 lbs of solids are collected.

WE CUT MAINTENANCE IN HALF

PAUL SIECHERT with **DONALD HARTLEY**
General Manager **Managing Editor**
Alhambra Foundry Co. Ltd.

Paul Siechert graduated from California Institute of Technology, Pasadena in 1938. He started with Alhambra Foundry as process control engineer, became secretary-treasurer and chief engineer in 1946, and this year became general manager. Siechert is a Scottish Rite Mason and a Rotarian. His hobbies include photography, music, and playing gin rummy with his boss, Clyde E. Hopping, president.

cured as surplus equipment from a government-owned antimony plant. Their practicability for iron foundry work has been proved by almost five years' continuous operation.

Installing this equipment required modification to the cupola. We had believed that steam produced in extinguishing cupola fires would cause trouble if allowed to enter the baghouse. We designed a counterbalanced ceramic-lined cap that could be opened manually, but have since found that steam causes no apparent damage in the baghouse. A fire-brick-lined outlet is located near the cupola top to feed smoke into a tee, where quench air is applied by a blower. This reduces cupola effluent temperature from 2150 F to 1100 F and permits gases to pass through mild steel instead of alloy steel flues.

From the quench tee, gases pass through a balloon flue to a header that feeds two parallel lines of cooling flues. These cooling flues are made of 38-inch diameter pipe 45 feet high, each with four U-bends and a common hopper at the base.

exhaust fan moves gases

An exhaust fan draws gases through the cooling flues to a baghouse pressure chamber. Baghouse hopper has a 3- to 4-in. wg positive pressure. About 2 in. wg negative pressure is maintained at the exhaust fan inlet.

Quench gas to be recirculated is drawn through a separate fan from the end of the cooling flues and returned to the quench tee. Positive circulation in the quench circuit is assured by a 3-in. wg negative pres-haust fan inlet.

Baghouse operates under a 3- to 4-in. wg pressure and handles up to 4 cu ft of gas per sq ft of bag area. Bags are 11½ inches diameter and 15 feet long. They are supported at the top on movable frames, which may be manually shaken to remove accumulated dust. Baghouse hopper is partitioned into four sections so that pressure can be shut off for emptying several bags without halting smoke-abatement op-

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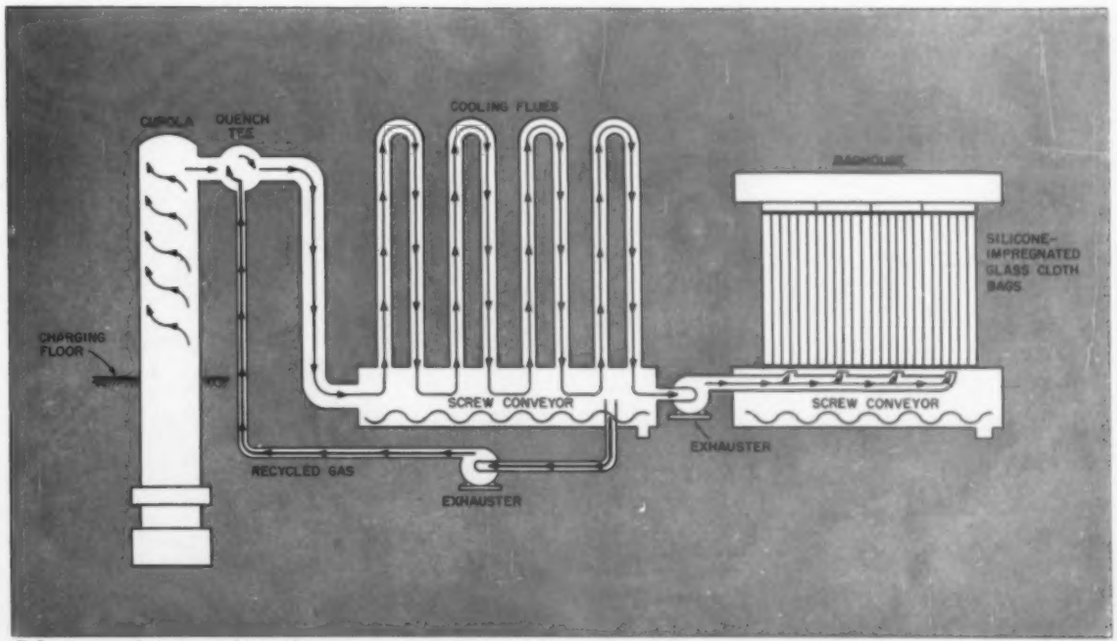

Schematic of system shows how some cooled gases are recycled back to quench tee to cool cupola effluent.

Air conditioning and refrigeration

III -- Mixtures of gases, gases and vapors; psychrometrics

JOHN F. LEE
Professor of Mechanical Engineering
North Carolina State College
with DONALD HARTLEY, Managing Editor

Start right now to review the principles related to day-to-day air conditioning and refrigeration problems. Each article in IP's POWER BASICS will cover some facet of air conditioning or refrigeration that will help you do your job better. Each one can be read without reference to the others and without any loss of continuity. Single sets of the complete series will be available without charge. Send in your request now. We will hold it until complete set is ready. Quantity prices upon request.

SUPPOSE A SEALED container holds a mixture of ideal gases, each at the same temperature. Each constituent of the mixture occupies the entire volume of the container. This is possible because molecules of a gas are far apart. Molecules of one gas are interspersed in the spaces between molecules of other gases in the mixture. If we denote the pressure of a constituent as its *partial pressure*, Dalton's law states that *total pressure of a mixture of gases is equal to the sum of partial pressures of the constituents*. This assumes that each constituent occupies the volume of the mixture at the same temperature as the mixture.

For example, if a gas mixture consists of three constituents (say 1, 2, and 3) a mathematical statement of Dalton's law is

$$P = P_1 + P_2 + P_3$$

if $V = V_1 = V_2 = V_3$

and $T = T_1 = T_2 = T_3$

Suppose all constituents are ideal gases at temperature T and each occupies a separate container with a volume V, as shown in Fig. 1. Equations of state for these gases are written as

$$P_1V = m_1R_1T$$
$$P_2V = m_2R_2T$$
$$P_3V = m_3R_3T$$

from which we get

$$P_1 = \frac{m_1R_1T}{V}$$
$$P_2 = \frac{m_2R_2T}{V}$$
$$P_3 = \frac{m_3R_3T}{V}$$

Now suppose the gases are all confined in a single container with volume V, and that their temperatures remain at T. According to Dalton's law, pressure of the mixture is

$$P = P_1 + P_2 + P_3$$

and, therefore, we have

$$P = P_1 + P_2 + P_3 = (m_1R_1 + m_2R_2 + m_3R_3)\frac{T}{V} \qquad (1)$$

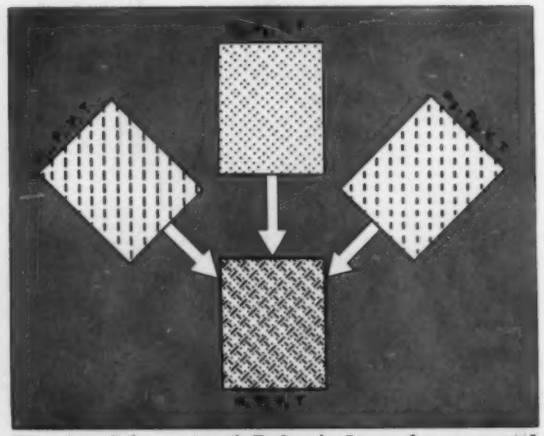

Fig. 1 — Schematic of Dalton's Law shows partial pressures of gases making up total mixture pressure.

It is convenient to define the *apparent gas constant* of the mixture R by the equation

$$R = \frac{m_1R_1 + m_2R_2 + m_3R_3}{m_1 + m_2 + m_3}$$

Equation (1) can then be written

$$pV = mRT \qquad (2)$$

This has the same form as the equation of state for a single ideal gas, and shows that a mixture of ideal gases is itself an ideal gas.

EXAMPLE: A tank contains 4 cu ft of a gas mixture consisting of 3 pounds CO_2 and 2 pounds N_2 at 80 F. Determine (a) pressure of the mixture and (b) its apparent gas constant.

SOLUTION: (a) Partial pressure of each constituent is found from the equation of state for an ideal gas, noting that each constituent occupies a volume of 4 cu ft at 80 F. Gas constant of each constituent is obtained by dividing the universal gas constant by the molecular weight. Molecular weight of CO_2 is 12 + 32 = 44 and

$$R_{CO_2} = \frac{1545}{44} = 35.1 \text{ ft lb/lb R}$$

Similarly, for N_2 we get

$$R_{N_2} = \frac{1545}{28} = 55.1 \text{ ft lb/lb R}$$

From the equation of state for an ideal gas, partial pressure of CO_2 is

$$P_{CO_2} = \frac{mRT}{V} = \frac{(3)\ (35.1)\ (540)}{(4)\ (144)} = 98.9 \text{ psi}$$

Partial pressure of N_2 is

$$P_{N_2} = \frac{mRT}{V} = \frac{(2)\ (55.1)\ (540)}{(4)\ (144)}$$
$$= 103.5 \text{ psi}$$

From Dalton's law we obtain pressure of the mixture as

$$P = P_{CO_2} = P_{N_2} + 98.9 + 103.5 = 202.4$$

(b) Apparent gas constant of the mixture can be obtained from the equation of state for an ideal gas applied to the mixture

$$R = \frac{pV}{mT} = \frac{(202.4)\ (144)\ (4)}{(5)\ (540)}$$
$$= 43.2 \text{ ft lb/lb R}$$

or from its definition as

$$R = \frac{m_1R_1 + m_2R_2}{m_1 + m_2} = \frac{(3)\ (35.1 + 2)\ (55.1)}{(3 + 2)}$$
$$= 43.1 \text{ ft lb/lb R}$$

mixtures of gases and vapors

Temperature and pressure of a saturated vapor are dependent conditions. Temperature of a saturated vapor fixes its pressure, and vice versa. But what happens if other gases are introduced into the space occupied by the vapor? At low pressures, such a mixture of gases and vapors may be handled by the methods described for mixtures of gases, with one important exception. Since partial pressure of the vapor *(vapor pressure)* is dependent on temperature, the sum of partial pressures of the other substances in the mixture is equal to the total pressure of the entire mixture less the partial pressure of the vapor.

Suppose we raise the mixture temperature, keeping pressure constant, while the vapor constituent is in equilibrium with its liquid. More liquid will evaporate. After the liquid phase disappears, raising the mixture temperature further will superheat the vapor. This mixture may now be treated as a mixture of gases. Partial pressure of the superheated vapor, like the other constituent gases, is related to total pressure through its mole fraction.

EXAMPLE: A mixture consists of saturated water vapor and CO_2 in equilibrium at 100 F and at a total pressure of 14.696 psia. Find the partial pressure of each constituent.

SOLUTION: Pressure of saturated water vapor at 100 F is found from Table I in the steam tables to be 0.9492 psia (say 0.949 psia). This is the partial pressure of the water vapor. Partial pressure of CO_2 is the total pressure of the mixture less the partial pressure of the water vapor, or

$$14.969 - 0.949 = 13.747 \text{ psi}$$

what is psychrometrics

Dry air is a mixture of constituent gases which comprise atmospheric air, excluding water vapor. Dry air composition is substantially constant at 78 percent nitrogen, 21 percent oxygen, and 1 percent argon (by volume). Argon and traces of other rare gases present in air are usually grouped with nitrogen in what is called *atmospheric nitrogen*. Volumetric analysis of air is often given simply as 21 percent oxygen and 79 percent atmospheric nitrogen. Corresponding gravimetric (or mass) analysis is 23.2 percent oxygen and 76.8 percent atmospheric nitrogen.

Saturated air is a mixture of dry air and saturated water vapor. Note that the water vapor is saturated, not the air.

Unsaturated air is a mixture of dry air and superheated water vapor.

Specific humidity or *humidity ratio* is defined as ratio of water vapor mass to dry air mass in a given volume of mixture, or

$$w = \frac{m_v}{m_a}$$

where w = specific humidity,
m_v = water vapor mass in a given volume of mixture,
and m_a = dry air mass in the same volume of mixture.

Since dry air and water vapor each occupy the entire volume of the mixture, specific humidity may be also defined in terms of specific volumes, or densities, of water vapor and dry air.

$$w = \frac{m_v}{m_a} = \frac{p_v}{p_a} = \frac{p_v/R_vT}{p_a/R_aT} = \frac{R_ap_v}{R_ap_v}$$
$$= \frac{18.016\ p_v}{28.966\ p_a} = 0.622\ \frac{p_v}{p_a} \qquad (3)$$

Derivation of Eq. (3) presupposes that vapor behavior is adequately represented by the equation of state for an ideal gas. Although this supposition is adequate for normal humidity problems, it would be entirely inadequate in the case of high-temperature drying.

Relative humidity is defined as the ratio of water vapor partial pressure in a mixture to water vapor saturation pressure at the same temperature. Atmospheric air, which is a mixture of dry air and water vapor, is at a sufficiently low pressure that it closely approximates an ideal gas. Under these conditions, relative humidity may also be defined as the ratio of density of vapor in the mixture to density of saturated vapor at the same temperature. Although the difference in values obtained from these two definitions for atmospheric air at normal temperature and pressure is negligible, it may be significant at higher pressures. Since both definitions are in use, it is necessary to ascertain on which basis relative humidity data are presented. In mathematical symbols, relative humidity is

$$\text{R.H.} = \frac{p_v}{p_g} \qquad (4)$$

where R.H. = relative humidity,
p_v = partial pressure of water vapor in the mixture,
and p_g = saturation pressure at the same temperature.

If the ideal gas relationships are assumed to hold, relative humidity can be written

$$\text{R.H.} = \frac{p_v}{p_g} = \frac{RT/v_v}{RT/v_g} = \frac{v_g}{v_v} = \frac{d_v}{d_g} \qquad (5)$$

where d = density.
It can be seen from Eq. (4) or Eq. (5) that when R.H. = 1, water vapor in the mixture is saturated.

Comparison of Eqs. (3) and (4) shows that specific humidity and relative humidity are related as follows

$$w = \text{R.H.}\ \frac{d_g}{d_v} = \text{R.H.}\ \frac{v_a}{v_g} = 0.622\ \text{R.H.}\ \frac{p_g}{p_a} \qquad (6)$$

If Dalton's law is applied, we get

$$w = 0.622\ \frac{p_v}{p - p_v} \qquad (7)$$

where p = total pressure of mixture or barometric pressure for atmospheric air.

Dew-point temperature is defined as the temperature at which unsaturated air becomes saturated (i.e., vapor begins to condense) following a cooling process at constant pressure and constant specific humidity. Let's investigate the effect of such a process on partial pressure of the vapor.

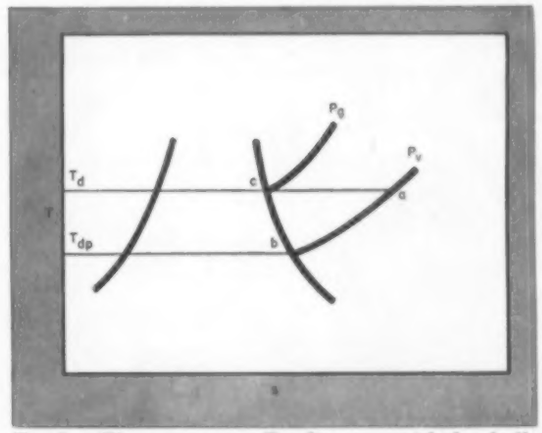

Fig. 2 — Water vapor on T-s diagram, with dry-bulb and dew-point temperatures shown as T_d and T_{dp}.

From Eq. (7),

$$p_v = \frac{wp}{w + 0.622}$$

Since total pressure of mixture and specific humidity are constant, it follows that partial pressure of the vapor must also be constant. Fig. 2 clearly shows that if vapor pressure is constant, then partial pressure of the water vapor is saturation pressure of the vapor at dew-point temperature. Vapor pressure, therefore, may be found from steam tables as the

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saturation pressure corresponding to the dew-point temperature of the air.

Dry-bulb temperature is simply the equilibrium temperature of the air-vapor mixture as indicated by an ordinary thermometer. Dry-bulb temperature is shown in Fig. 2 as T_d and dew-point temperature as T_{dp}.

Thermodynamic wet-bulb temperature or *adiabatic saturation temperature* is, as the alternate name implies, the equilibrium temperature reached when an air-vapor mixture experiences an adiabatic cooling process to saturation.

define wet-bulb temperature

Fig. 3 shows an insulated chamber containing a body of water that has a very large surface area. Unsaturated air with a dry-bulb temperature T_{d_1} enters the chamber at Point 1, flows at constant pressure over the water surface, and leaves as saturated air with a dry-bulb temperature T_{d_2} at Point 2. Since the chamber is insulated, no heat transfer takes place between the system (consisting of the air-vapor mixture and water) and its surroundings. No work is done, and the difference between velocities entering and leaving the chamber is assumed to be negligible.

When unsaturated air passes over the water surface, some water is evaporated. Since energy for

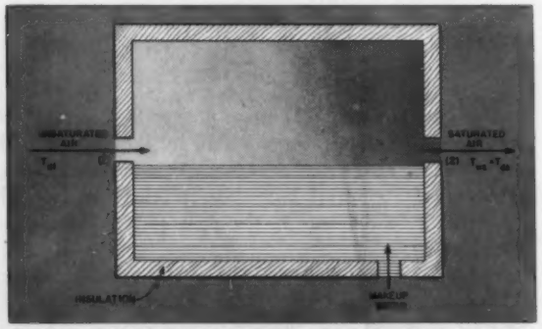


Fig. 3 — Adiabatic saturation process, where energy used for evaporation comes only from within system.

evaporation comes from both the air-vapor mixture and water in the chamber (system is isolated), dry-bulb temperature of the air decreases and water temperature also decreases. This process continues until dry-bulb temperature of the air and water temperature reach equilibrium. At this point the air is saturated, and the equilibrium temperature is called the *thermodynamic wet-bulb temperature* or *adiabatic saturation temperature*.

Adiabatic cooling process for the vapor in the air-vapor mixture is shown in the T-s diagram of Fig. 4. Vapor is initially at dry-bulb temperature T_{d_1} and is cooled adiabatically to dry-bulb temperature T_{d_2}, which is equal to thermodynamic wet-bulb temperature T_{w_2}. Note that although the dew-point, dry-bulb, and wet-bulb temperatures have the same values for saturated State 2, these temperatures are not identical for unsaturated State 1.

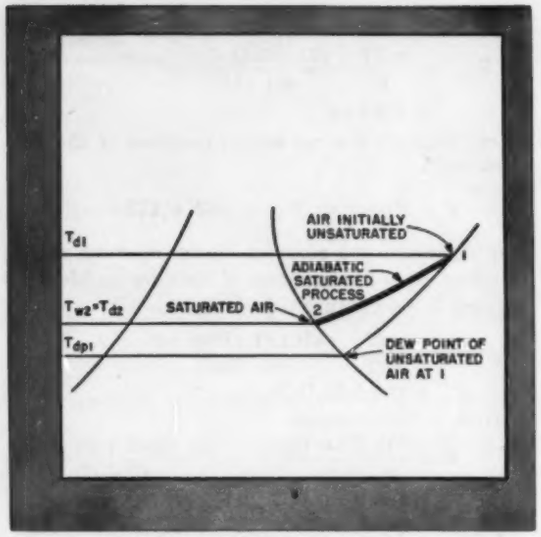


Fig. 4 — Adiabatic saturation process for cooling vapor of air-vapor mixture shown on T-s diagram.

wet-bulb temperature only close

An exact determination of the thermodynamic wet-bulb temperature is not practical, but a close approximation can be obtained by means of a wet-bulb thermometer. We shall refer to the temperature read from a wet-bulb thermometer simply as the wet-bulb temperature, to distinguish it from the thermodynamic wet-bulb temperature or adiabatic saturation temperature. A wet-bulb thermometer is identical to an ordinary thermometer except that the bulb is provided with a wick, moistened with clean water. This wick provides a thin film of water on the bulb.

A sling psychrometer consists of matched wet-bulb and dry-bulb thermometers attached to a holder. This assembly can be whirled in the air to induce turbulent air flow over the wet-bulb and thus provide for convection heat transfer. If the air is unsaturated, water in the wick is cooled by evaporation until its temperature falls below dry-bulb temperature of the air. Then heat transfer from air to wick continues the evaporation process until equilibrium or wet-bulb temperature is reached.

Difference between wet-bulb temperature and thermodynamic wet-bulb temperature is negligible for atmospheric air at barometric pressure, normal temperature, and low air velocities. This is not necessarily true of other mixtures of gases and vapors, however. ♦ ♦

Aluminum bus

. . . starts on page 14

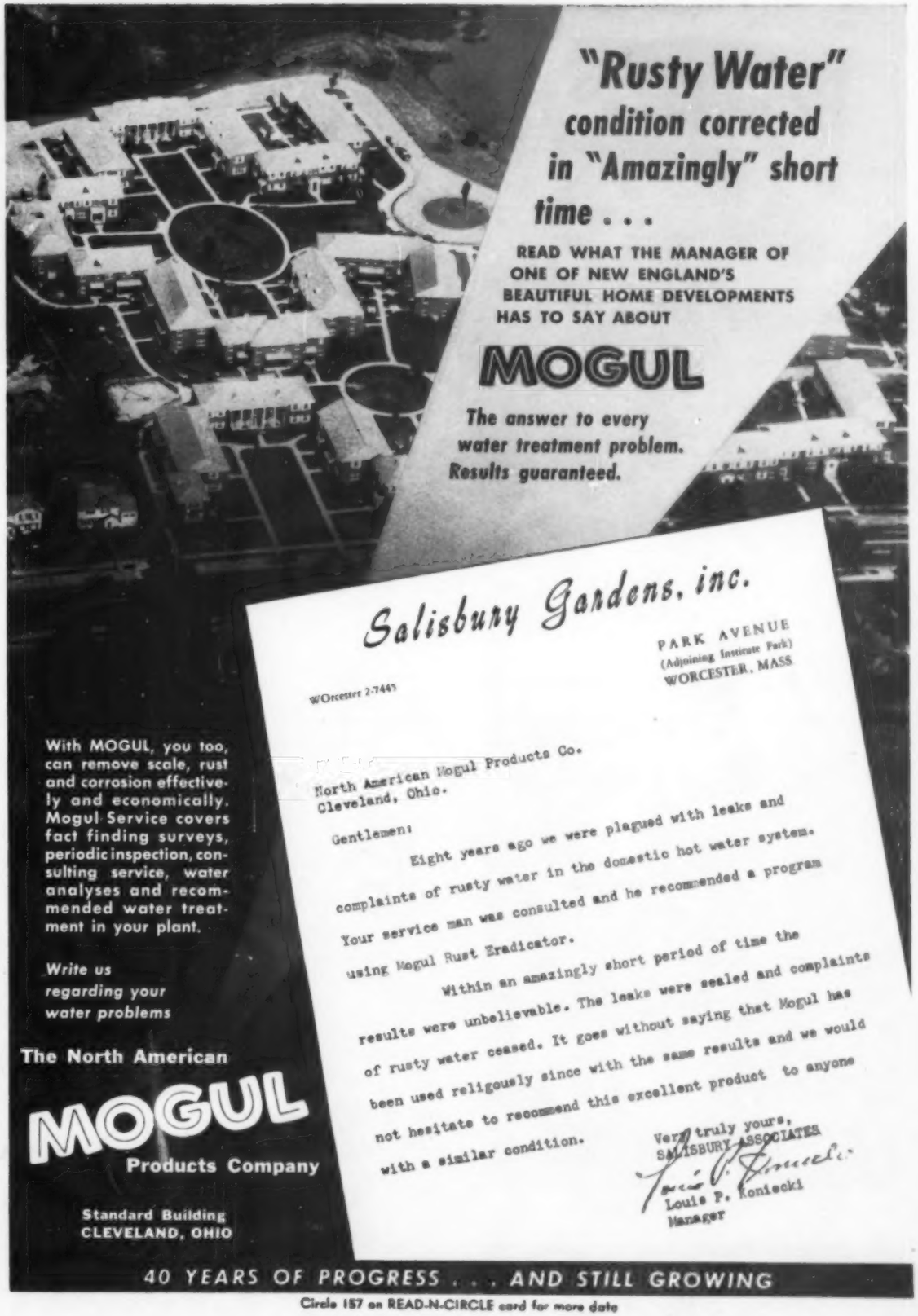
Vertical aluminum section is bolted to horizontal copper plate where entering a building near ground.

place between each two ground-assembled sections.

We already know, from past experience, that aluminum-to-copper joints, when properly made with No-ox-ide grease, cause no trouble. Novel design and construction features employed on this

Steel rectangles provide rigidity. Sloping bus is unsupported between buildings of different elevations.

job all appear to have been well justified. Based on experience to date, we would repeat this construction if an equivalent bus should be needed in the future. ♦ ♦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Cleveland, Ohio.
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Eight years ago we were plagued with leaks and
complaints of rusty water in the domestic hot water system.
Your service man was consulted and he recommended a program
using Mogul Rust Eradicator.
Within an amazingly short period of time the
results were unbelievable. The leaks were sealed and complaints
of rusty water ceased. It goes without saying that Mogul has
been used religously since with the same results and we would
not hesitate to recommend this excellent product to anyone
with a similar condition.
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Louis P. Koniecki
Manager
With MOGUL, you too,
can remove scale, rust
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periodic inspection, consulting service, water
analyses and recommended water treatment in your plant.
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Standard Building
CLEVELAND, OHIO
40 YEARS OF PROGRESS . . . AND STILL GROWING
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Safe ice remedy is 99.99% active

A new chloride-free ice and snow melting material in prismoid form, that is harmless to pavements, metals and vegetation, is available from Speco, Inc., Cleveland. Known as ICE REM-CF, it is 99.99% chemically active and contains neither calcium nor chlorides.

Unlike ordinary ice and snow melting chemicals, CF does not produce a heat effect as part of its melting process. This feature makes it ideal for application on cement, concrete and asphalt. In addition, it will not corrode aluminum and other metals.

According to the manufacturer, ICE REM-CF thaws ice and snow quickly on steps, walks, loading platforms, streets, airport runways, railway switches, gutters and drains. As it produces a combined melting and abrasive action, it is recommended for use in street car, bus and truck sand boxes and under spinning automobile wheels.

Because its molecular structure has a greater depressing point on ice than salt, ICE REM-CF has substantially more thawing capacity at lower temperatures and in the sub-zero range. It leaves no messy residue and is non-hygroscopic (won't absorb moisture from the air). Consequently, it is cleaner to use and simpler to store than chloride-type products.

CF is a companion product of regular ICE REM, which has been marketed by Speco, Inc. for the past 10 years and was the first ice and snow-melting pellet sold commercially. It is available for shipment in hopper cars or dump trucks plus 100, 200, 300 and 500-lb. fiber drums. Ton lots are packaged in 100-lb. I.C.C. approved shipping bags.

SPECO, INC., 7308 Associate Avenue, Cleveland 9, Ohio.

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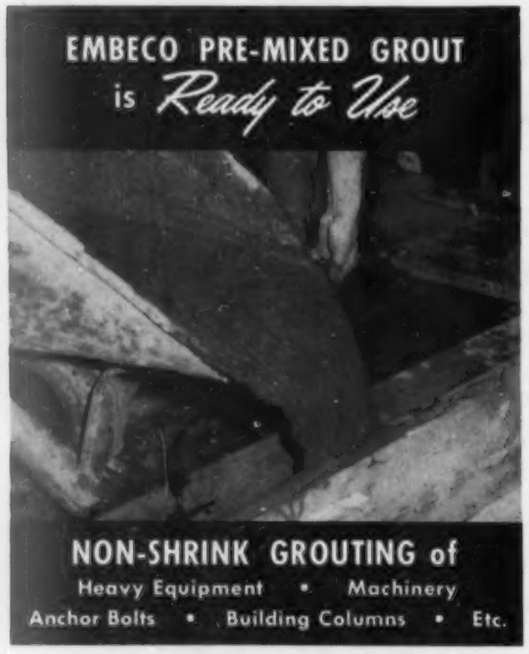
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McLouth parlays steam

. . . starts on page 12

when fired with blast furnace gas and supplementary oil. System can accommodate coke oven gas as additional supplemental fuel.

Control system is built around a master steam pressure regulator and blast furnace gas pressure-limiting regulator. Both are common to the complete system for all three boilers. Steam pressure regulator measures pressure in the main steam header. It develops an air-loading pressure that is transmitted to each boiler controller. Waste blast furnace gas pressure regulator measures pressure in the blast furnace gas header. With these regulators and additional control equipment, normal firing conditions are maintained as long as steam demand and blast furnace gas pressure remain constant.

what happens if pressure drops?

If blast furnace gas pressure drops to a predetermined minimum, additional fuel oil is introduced and the two fuels are used together. When blast furnace gas pressure becomes too low, gas is cut off and firing is continued using oil only. Before gas is turned on again, gas lines are purged with steam. Firing controls are tied in with damper operation on forced-, and induced-draft fans. These dampers will close on low air demand to hold fan turbine drives above stalling speed.

High-pressure steam drives 4000-kw turbogenerator, two turboblowers, three induced-draft fans, two boiler feed pumps, fire pump, and pilot fire pump. Turbines driving generator and induced-draft fans exhaust into 150-psig system, which supplies steam to all other auxiliaries. This system also supplies mill process steam. With exception of condensing turbines driving the blowers and fire pump which has atmospheric exhaust, all low-pressure equipment exhausts at 10 psig. About 40,000 lb/hr of high-pressure steam is taken to an air separation plant. After driving compressors, about 28,000 lb/hr is returned to boilerhouse as condensate.

supply for auxiliaries

Pressure-reducing and desuperheating system reduces 625-psig steam to augment the 150-psig steam supply feeding auxiliaries. A separate 50,000 lb/hr pressure-reducing and desuperheating station draws directly from the high-pressure steam supply. This station provides 150-psig steam for sudden blast furnace demands without curtailing normal supply to devices using 150-psig steam.

Exhaust steam at 10 psig heats and deaerates water and supplies heat for hot lime softeners. A pressure-reducing valve supplies makeup steam from the 150-psig system to make up any deficiency of 10-psig steam. Excess heat is released to atmosphere through two Cochrane multiport relief valves.

Boiler water is taken from the Detroit River and treated before using. Raw water is delivered to two hot lime softeners that have a combined capacity of 48,000 gph. Sedimentation tanks are vertical, cylindrical types 15 feet in diameter and 20 feet high. They have ladders and platforms for access to all operating points. Water passes through four

PRINCIPAL BOILER HOUSE EQUIPMENT

Steam Generating Equipment

3 Boilers ..... **Babcock & Wilcox Co.**
120,000 lb/hr each, 625 psig, 825 F, two-drum Stirling type, fired with blast furnace gas and oil.

3 Forced Draft Fans ..... **Sturtevant Div., Westinghouse Electric Corp.**
177,000 lb/hr of air, 105 F, 10.3 in. water, 1300 rpm.

3 Induced Draft Fans ..... **Sturtevant Div. Westinghouse Electric Corp.**
345,000 lb/hr of gas, 492 F, 9.9 in. water, 765 rpm.

3 Forced-Draft Fan Turbines ... **DeLaval Steam Turbine Co.**
150-psig steam, 670 FTT at throttle, 10-psig exhaust pressure.

3 Induced Draft Fan Turbines ... **DeLaval Steam Turbine Co.**
600-psig steam, 810 FTT at throttle, 165-psig exhaust pressure.

Sootblowers ..... **Copes-Vulcan Div. Blaw-Knox Co.**

Feed-Water System

2 Boiler Feed Pumps .....**DeLaval Steam Turbine Co.**
900 gpm, 230 F, 750-psig discharge, driven by DeLaval turbines.

2 Feed-Water Booster Pumps ... **DeLaval Steam Turbine Co.**
550 gpm, 230 F, 63-psig discharge, driven by DeLaval turbines.

2 Desuperheater Spray Pumps .. **DeLaval Steam Turbine Co.**
150 gpm, 100 F, 250-psig discharge, driven by DeLaval turbines.

2 Hot Lime Softeners ..... **Cochrane Corp.**
24,000 gph.

4 Filters ..... **Cochrane Corp.**

4 Hot Zeolite Softener Units ..... **Cochrane Corp.**

1 Jet-Tray Thorofare Type Deaerator ..... **Cochrane Corp.**

2 Electric Chemical Feeds ..... **Cochrane Corp.**

2 Filter Backwash Pumps ..... **DeLaval Steam Turbine Co.**
600 gpm, 230 F, 60 psig, 1750 rpm, driven by 15-hp motor.

Fuel Oil System

2 Imo Fuel Oil Pumps ..... **DeLaval Steam Turbine Co.**
84.6 gpm Bunker C fuel oil, 250 psig, driven by DeLaval turbines.

1 Oil Tank Suction Heater ..... **Adsco Industries, Inc.**

2 Fuel Oil Line Heaters ..... **Adsco Industries, Inc.**
3600 gph from 100 F to 210 F with steam at 150 psig and 670 FTT.

Power Generating Equipment

1 Turbogenerator ..... **Westinghouse Electric Corp.**
Air cooled, 4000 kw, 3600 rpm, driven by direct-connected turbine operating at 600 psig, 810 FTT with 150-psig exhaust.

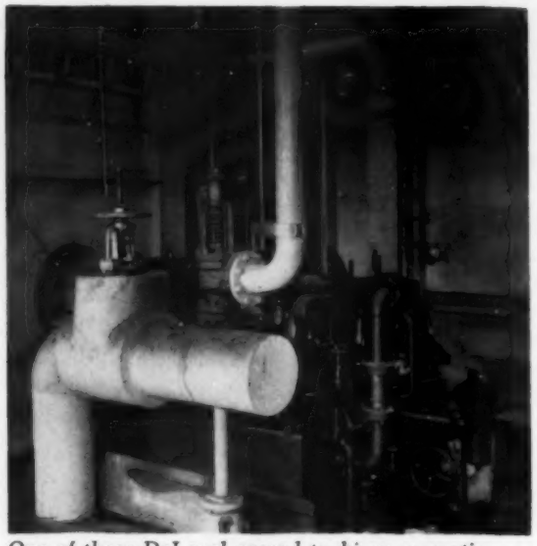
Substation Equipment

22 Units Metal Clad 6900-volt Switchgear..... **Westinghouse Electric Corp.**

6 Units Metal Clad 2300-volt Switchgear..... **Westinghouse Electric Corp.**

2 Transformers, 1000 kva, 6900/2300 Volt..... **Westinghouse Electric Corp.**

1 Transformer, 750, kva 6900/480 Volt..... **Westinghouse Electric Corp.**



One of three DeLaval geared turbines, operating on 150-psi steam, that drive 177,000 lb/hr F.D. fans.

cylindrical 8-foot diameter by 4-foot long filters after leaving the hot softeners. It goes through four cylindrical 5-foot diameter by 5-foot long hot zeolite softeners for final hardness removal. Feed-water booster pumps lift treated water to a jet-tray type deaerator designed for an outlet capacity of 412,500 lb/hr. Capacity is sufficient for all three boilers. Storage for deaerated water will sustain operation for 10 minutes at full load on all boilers.

Feed-water flows by gravity to the boiler feed pumps after deaeration. Two turbine-driven boiler feed pumps are used. Each has 900-gpm capacity and can supply all boilers at full load.

In addition to water treating system, sulphite and phosphate systems are installed for manual introduction of chemicals.

condensate contains oil

Condensate returned from air separation plant is contaminated with oil. This oil must be removed before returning to feed-water system. Oily condensate is fed into three cylindrical 3½-foot-diameter by 4-foot-long filters. Preformed floc is added from a cylindrical 30-inch-diameter by 30-inch-high preparation tank. After filtering, condensate goes into a 1000-gallon storage tank. It is pumped to deaerating feed-water heater from storage.

Two DeLaval blast furnace turboblowers each delivers 110,000 cfm of air under inlet conditions of 14.4 psia and 100 F against 30 psig discharge pressure. Each blower has 4 stages with 60-inch-diameter inlet and 48-inch-diameter discharge. Each is driven by a DeLaval 15-stage steam turbine. Turbines operate at throttle pressure of 600 psig and 800 F with

(continues on page 26)

ECON'S exclusive STOP-WATCH ACTION MAKES THE BIG DIFFERENCE

When current overload is continued beyond the safe and pre-determined time, exclusive Econ-Alloy breaks the circuit by changing directly from solid to liquid. The usual plastic stage is eliminated, insuring faster, more accurate protection against overloads and shorts . . .
ECON-ALLOY makes the DIFFERENCE
• Stops needless fuse blows safely
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You protect against needless fuse blows yet get faster, more accurate protection against shorts and dangerous overloads when you use ECON Dual-Element Fuses. The exclusively different breakaway action of the ECON-Alloy element gives you this important advantage.

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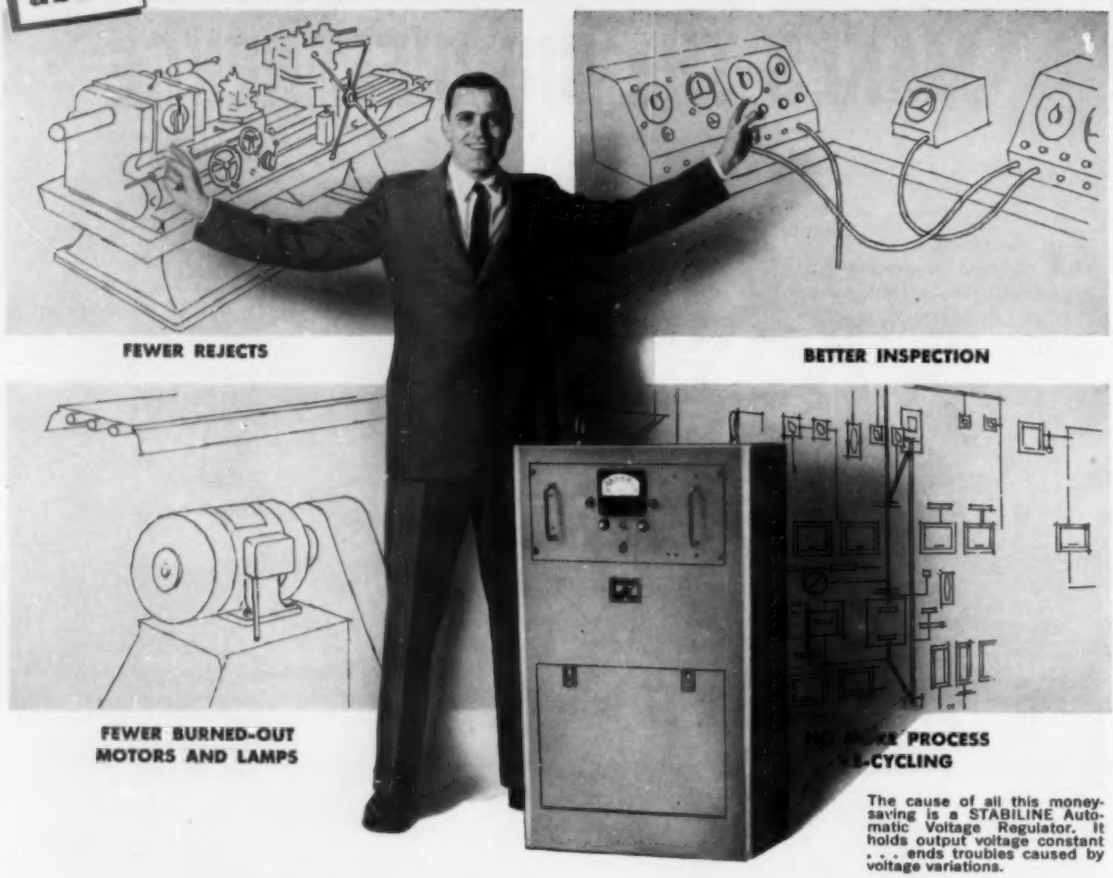
Facts about **STABILINE*** *Automatic* **Voltage Regulators**



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Company .....
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Circle 116 on READ-N-CIRCLE card for more data

McLouth parlays steam

. . . starts on page 12

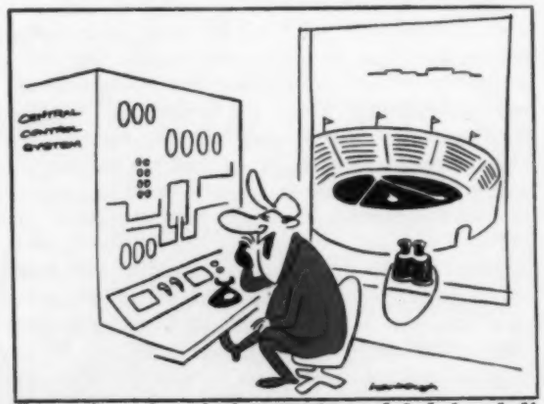
2-inch Hg absolute exhaust pressure. Normal speed of 2800 rpm develops approximately 12,400 BIHP.

Each turboblower is paired with an 8500-sq ft C. H. Wheeler surface condenser. Condenser is designed for 87,670 lb/hr of steam and absolute pressure of 2-inches Hg absolute when supplied with 9350 gpm of 75 F cooling water. Each condenser has two 3-inch, two-stage condensate pumps rated 220 gpm at 175-foot discharge head. These pumps return condensate to the deaerating feed-water heater. Both pumps are turbine driven. One is equipped, also, with auxiliary motor drive for emergency operation. Condensers are spring-mounted with rigid bolted connections to turbine exhausts.

Turboblowers are arranged with throttles facing central aisle. Operating panelboards are located at the end of this aisle. Operator is in position always to observe important gage readings. Stairway between turboblowers gives access to condensers.

A 4000-kw Westinghouse turbogenerator uses available blast furnace gas to the fullest extent. This unit consists of a noncondensing steam turbine designed for 600 psig, 800 F at turbine throttle, and with exhaust pressure of 150 psig. Turbine is direct-connected to a 4000-kw, 0.80 pf, 6900-volt, 3-phase, 60-cps generator with an exciter and generator air cooler. It is a base load unit supplying part of power requirement for the hot metal area.

Switchgear receives 6900-volt power from the 4000-kw turbogenerator and from two outside utility ties. Power is then fed to river pump house, blast furnace area, oxygen inversion process plant, and a 2300-volt ore bridge substation located in the boiler house. All incoming switchgear feeders and outgoing distribution lines are carried in metal trough supported from a lower floor. ♦ ♦



Steam flow okay, boilers on 1st and 3rd, last half of the fourth.

Dry baghouse cuts upkeep

. . . starts on page 18

erations. As a rule we do not empty bags more than once a week.

Lifespan of the silicone-impregnated glass fabric bags is variable, depending on handling they receive and gas temperatures. Average lifespan is estimated at well over 24 months.

Our average melting rate is about eight tons per hour, with the cupola melting two hours a day. A typical cupola charge comprises 30 percent pig iron and 70 percent scrap iron. Even when greasy automobile scrap is melted, we have no trouble from tars or resins in the baghouse.

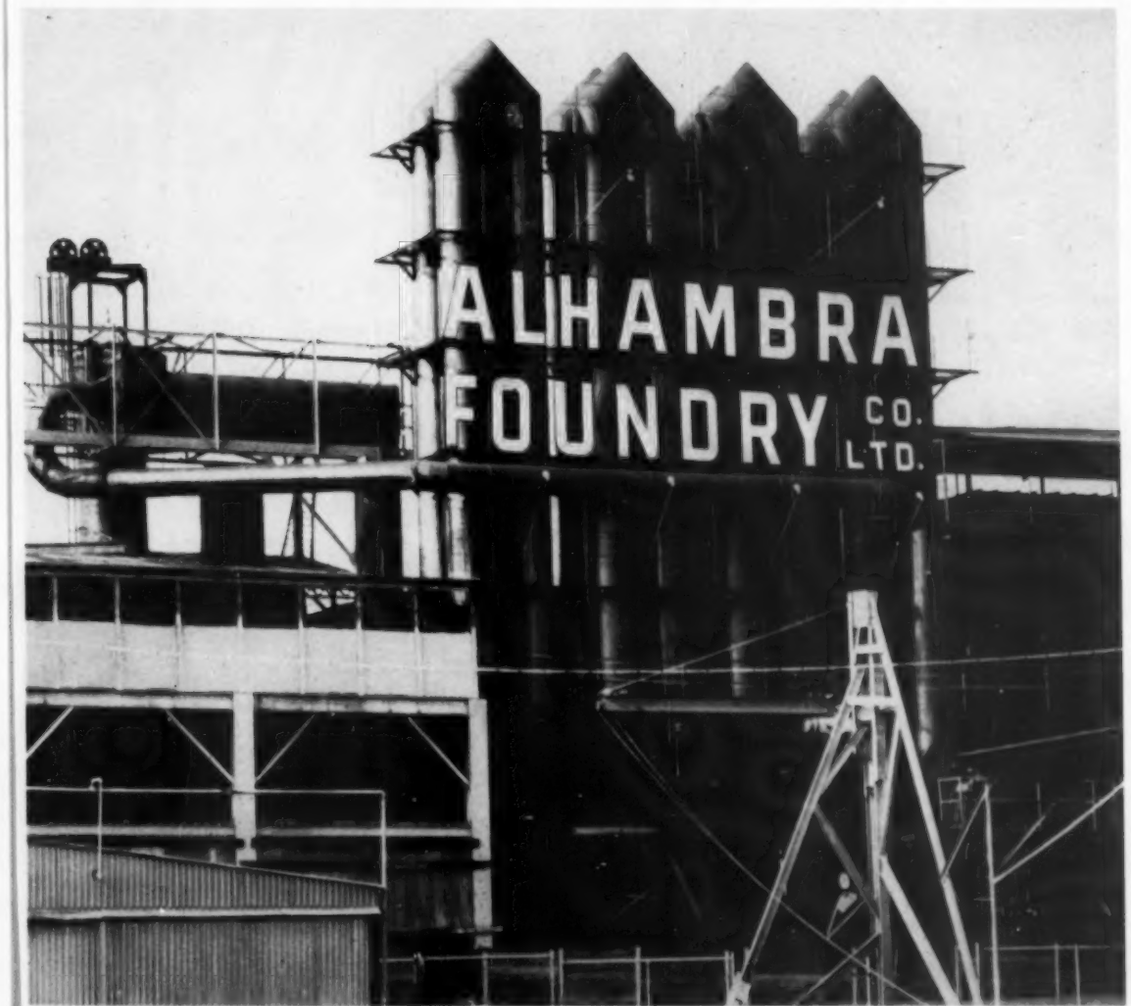
Baghouse fans start when the blast is turned on, and stop after dropping the bottom. Plant superintendent checks the baghouse during routine inspection rounds. No other operating labor is required.

After a heat, about one man-hour is required to service the collection unit. This involves emptying cooling flues as well as baghouse hoppers, since all large particles in the smoke are deposited in the flues. Screw-type conveyors facilitate all emptying operations.

solids accumulation

A typical week's solids accumulation in the collector weighs about 550 pounds. None of this is considered to be of commercial value.

We had some difficulty in keeping the cooling flues painted, because coatings must withstand operating temperatures above 500 F. By using relatively inexpensive mineral-pitch coatings, however, we have reduced flue painting schedules to twice a year. Components that are not exposed to



Two banks of cooling flues, 45 feet high, are made of 38-inch mild steel pipe. Baghouse is at right of flues.

This Bulletin can help you select a better-designed **Condensation Unit**

ACT NOW TO GET COMPLETE DATA on these American-Marsh *Redi-Return* Condensation Units. Then judge for yourself the better engineering and quality of pump and tank . . . built for extra years of trouble-free service.

EASY-TO-INSTALL DESIGN helps you . . . only two pipe connections are needed. Motor-pump units can be removed without disturbing piping.

THE BULLETIN shows sizes from 10,000 to 100,000 sq. ft. EDR, cast iron or copper-bearing steel tanks and single or duplex motors of 1750 or 3500 RPM. Optional mounting base styles suit any installation, even crowded locations. Performance Tables and "How to Select" suggestions make this bulletin most helpful to you. *Get your copy now*

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Lubrication—the only maintenance cost of these high-pressure Crane valves

THE CASE HISTORY—When an oil can is all you need to keep high pressure valves at peak efficiency year after year, you know your valve investment is a wise one.

That's how Philadelphia Electric Company feels about the Crane Pressure-Seal Bonnet Gate Valves at its Delaware Station—one of this utility's newest units, started up early in 1953.

The Crane valves, operating on boiler feed service at 2000 psi, 500° F., have demonstrated completely their maintenance-saving values.

The old practice of re-stressing bonnet bolts doesn't apply to these valves. Yet the body-bonnet joint remains completely tight. Never a leak; never a need for a wrench. Crane Pressure-Seal design, utilizing internal fluid pressure, maintains a positively leakproof metal-to-metal joint inside the body.

The seats and stuffing box on all valves remain equally tight. Operation is smooth, nonsticking. The Crane flexible wedge disc prevents binding under contraction.

Other value features of Crane Pressure-Seal design are compactness . . . weight saving with no loss of strength . . . and clean exterior lines that simplify insulation.

Power plants around the world report new performance records for Crane Pressure-Seal Bonnet Valves. Now's the time to consider this advanced design—in gates, globes, angles and stop-checks—for modernization or extension projects. Contact your local Crane Representative or write to address below.

CRANE VALVES & FITTINGS

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temperatures above 400 F retain a mineral-pitch finish for about five years.

Conditions assumed in computing cooling area required by our smoke collection equipment were:

Quantity of effluent from cupola, 7200 cfm;

Average cupola effluent temperature, 1700 F;

Quench air temperature, 350 F;

Gas temperature at cooling flue inlet, 1100 F; and

Gas temperature at cooling flue outlet, 400 F.

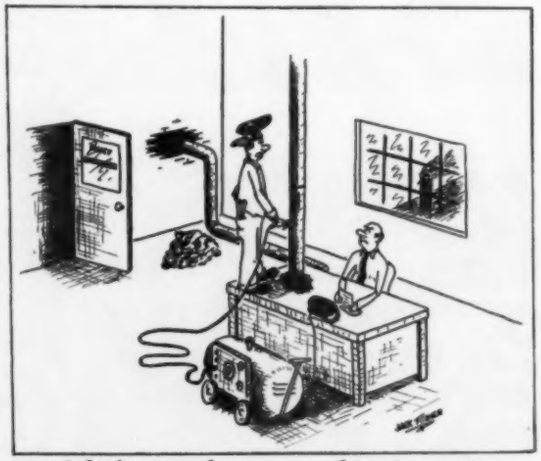
Heat transfer calculations give values ranging from 1.86 to 1.18 with an average of 1.52 Btu/hr/sq ft/per degree F. This gives a required cooling area of 11,920 sq ft under the assumed conditions.

Tests conducted by the Los Angeles Air Pollution Control District consistently show that the equipment operates within prescribed limits. (Table 1)

TABLE I ALLOWABLE DISCHARGE PER HOUR

Process weight (lb/hr)	Max. discharge (lb/hr)
100	.44
200	.83
500	1.73
1,000	2.80
2,000	4.23
5,000	7.33
10,000	12.00
20,000	24.00
40,000	48.00

Total particulate emission varies from about 0.8 to 1.6 grains/cu ft of stack emission. About 75 percent of this emission is coarser than 325 mesh (44 microns) and could be collected with almost any type of equipment. About 25 percent is below 325 mesh, and can be collected only with bag- or filter-type equipment. With dry-bag units, we are collecting all but 0.30 percent of the total emission. And we are still saving $1200 a year on maintenance. ♦ ♦



I don't care who you are, the print sez it goes through here!

Inplant water testing

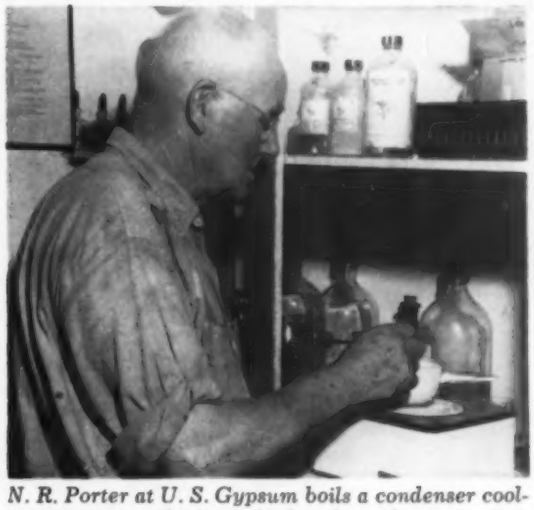
. . . starts on page 16

trol and takes pride in his daily report has the best boiler performance record. Hurried, harried operators are plagued continually with boiler shutdowns and repair bills.

Number of tests and testing frequency depends upon boiler horsepower and pressure, percentage of returns, and makeup water quality. Small boilers, operating at 15 psi or less on 95-percent returns, can be set up for a minimum water testing program.

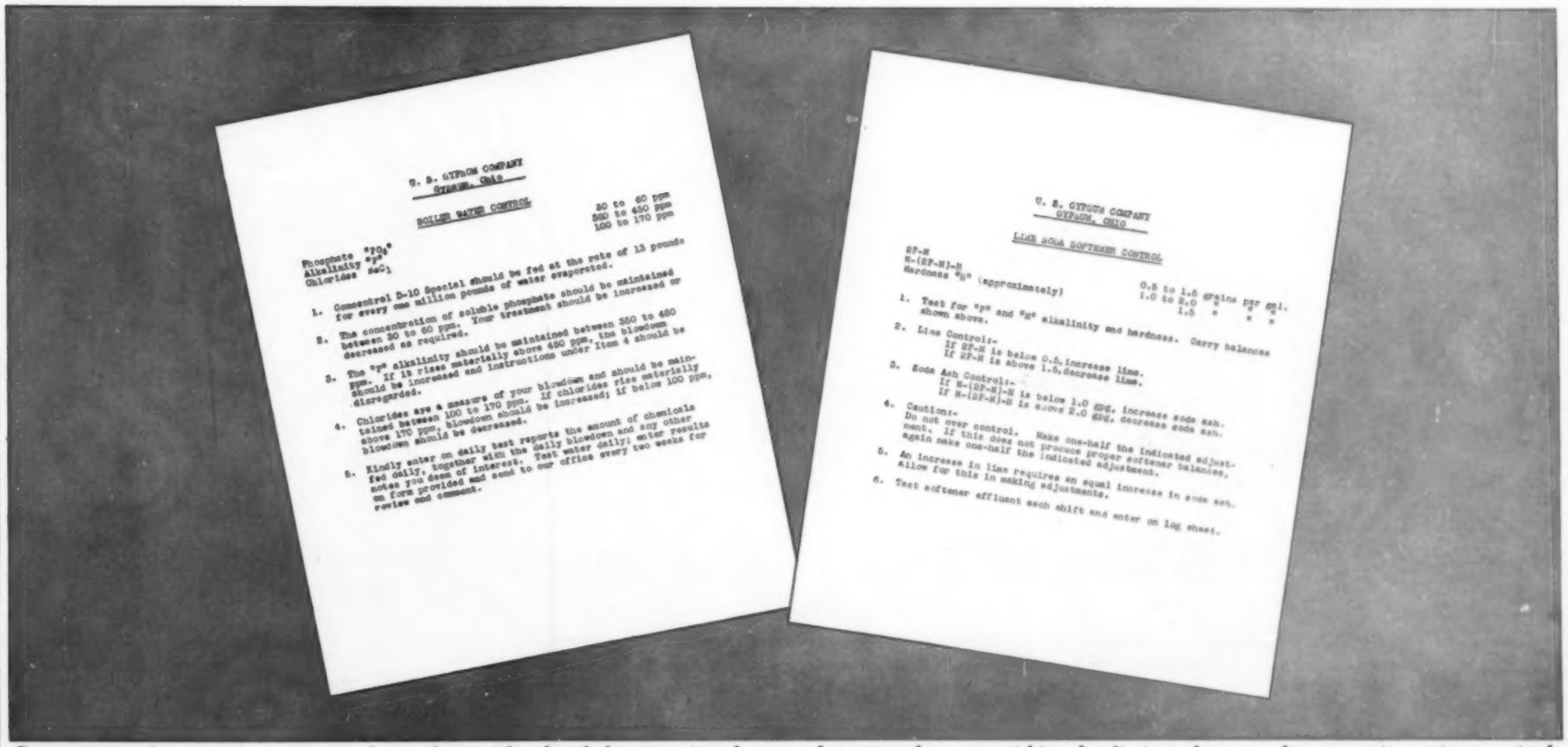
(continues on page 30)

B. L. Shinevar tests total alkalinity from U. S. Gypsum's lime soda softener with automatic burette.



N. R. Porter at U. S. Gypsum boils a condenser cooling water sample for polyphosphate determination.

A. F. Peterson at Willys Motors Inc. adding reagent to boiler water sample for phosphate determination.



U. S. GYPSUM COMPANY
GYPSUM, OHIO

BOILER WATER CONTROL

Phosphate $^{*}PO_4$	30 to 60 ppm
Alkalinity $^{*}p$	350 to 450 ppm
Chlorides $NaCl$	100 to 170 ppm

1. Consentrol D-10 Special should be fed at the rate of 13 pounds for every one million pounds of water evaporated.
2. The concentration of soluble phosphate should be maintained between 30 to 60 ppm. Your treatment should be increased or decreased as required.
3. The $^{*}p$ alkalinity should be maintained between 350 to 450 ppm. If it rises materially above 450 ppm, the blowdown should be increased and instructions under Item 4 should be disregarded.
4. Chlorides are a measure of your blowdown and should be maintained between 100 to 170 ppm. If chlorides rise materially above 170 ppm, blowdown should be increased; if below 100 ppm, blowdown should be decreased.
5. Kindly enter on daily test reports the amount of chemicals fed daily, together with the daily blowdown and any other notes you deem of interest. Test water daily; enter results on form provided and send to our office every two weeks for review and comment.

U. S. GYPSUM COMPANY
GYPSUM, OHIO

LIME SODA SOFTENER CONTROL

SP-H	0.5 to 1.5 grains per gal.
N-(SP-M)-H	1.0 to 2.0 " " "
Hardness $^{*}H$ (approximately)	1.5 " " "

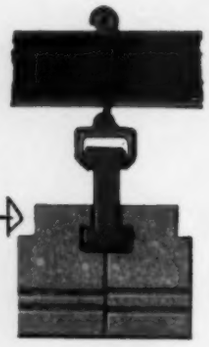
1. Test for $^{*}ps$ and $^{*}ps$ alkalinity and hardness. Carry balances shown above.
2. Lime Control:-
   If SP-H is below 0.5, increase lime.
   If SP-H is above 1.5, decrease lime.
3. Soda Ash Control:-
   If N-(SP-M)-H is below 1.0 gpg, increase soda ash.
   If N-(SP-M)-H is above 2.0 gpg, decrease soda ash.
4. Caution:-
   Do not over control. Make one-half the indicated adjustment. If this does not produce proper softener balances, again make one-half the indicated adjustment.
5. An increase in lime requires an equal increase in soda ash. Allow for this in making adjustments.
6. Test softener effluent each shift and enter on log sheet.

Company supplying water treatment chemicals provides detailed instruction sheets on how to make tests, within what limits to keep results, corrective action required.

This tile is called a dog bone!

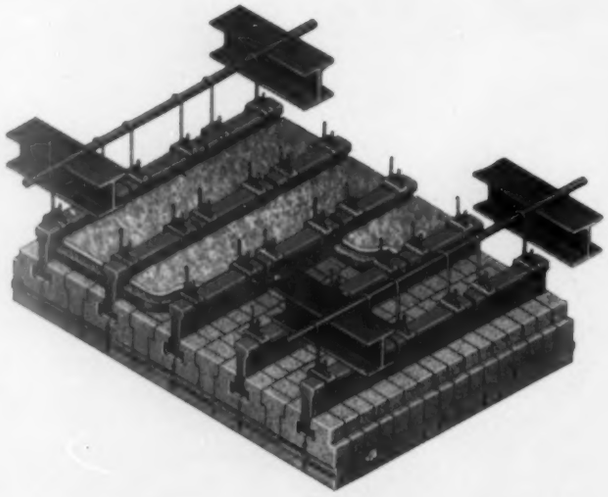
It's a husky supporting tile—used instead of an expensive alloy casting in a double suspended arch designed by B-L for high temperature aluminum, steel and glass furnaces. It can stand extremely high temperatures—can be used with or without insulation.

The dog bone supports two beam tile.



Bottom lugs are sloped so that the weight of the beam tile will draw the two together—like this:

Filler tile space out the arch so that the completed job looks this way:



Naturally the completed arch will possess all of the inherent characteristics of Bigelow-Liptak suspended construction. Burned out or damaged tile can be removed without disturbing large areas. Expansion is confined to individual tile—will not accumulate over the entire width of the arch. It all adds up to more production—less down time through keeping heat from raising the roof.

We'd like to tell you more about it. Just write.

BIGELOW-LIPTAK Corporation

AND BIGELOW-LIPTAK EXPORT CORPORATION

2550 WEST GRAND BOULEVARD, DETROIT 8, MICHIGAN

UNIT-SUSPENDED WALLS AND ARCHES

In Canada: BIGELOW-LIPTAK OF CANADA, LTD., *Toronto, Ontario*

ATLANTA • BOSTON • BUFFALO • CHICAGO • CLEVELAND • DENVER • HOUSTON • KANSAS CITY, MO. • LOS ANGELES • MIAMI • MINNEAPOLIS • NEW YORK • PHILADELPHIA • PITTSBURGH • PORTLAND, ORE. • ST. LOUIS • ST. PAUL • SALT LAKE CITY • SAN FRANCISCO • SEATTLE • TULSA • MONTREAL • SAULT STE. MARIE, ONT. • VANCOUVER • WINNIPEG

Circle 152 on READ-N-CIRCLE card for more data

Only pH and concentration of corrosion inhibitor need be checked, and only at weekly intervals. For larger boilers using more than 5-percent makeup water, these tests should be considered, depending on treatment used:

- Hardness
- Alkalinity
- Phosphate
- Sulfite
- Chlorides
- Total dissolved solids
- pH of return condensate

Extent of the testing program will be determined by the chemist or water consultant. Responsibility for carrying out testing recommendations, however, rests with the owner or plant manager. Remember that an owner or plant manager who insists on a regular inplant water testing program will benefit through lowered operating costs and upkeep. ♦ ♦

Boiler water treatment programs were designed by The Bird-Archer Company, Dept. IP, 4337 North American St., Philadelphia 40, Pennsylvania. For more information, circle 745 on READ-N-CIRCLE card on page 47.

Great day in the mornin', Zeke — thinka all the corn we could make with just a piece of this outfit . . .

a new reader service . . . .

the LOCATOR

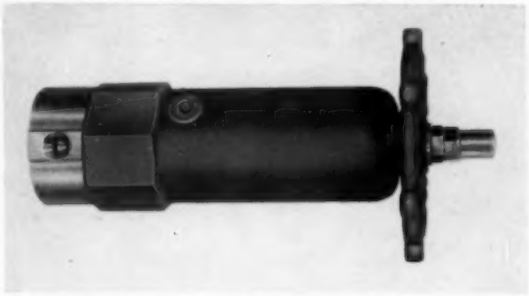
Turn to page 53 and you'll find a complete listing of all advertisers and the local offices they have ready to serve you. Information in a hurry is yours with INDUSTRY POWER's new LOCATOR . . . see page 53

new products

. . . just circle key numbers on READ-N-CIRCLE card on pages 47 or 48

700-Here's pressure-reducing relief valve

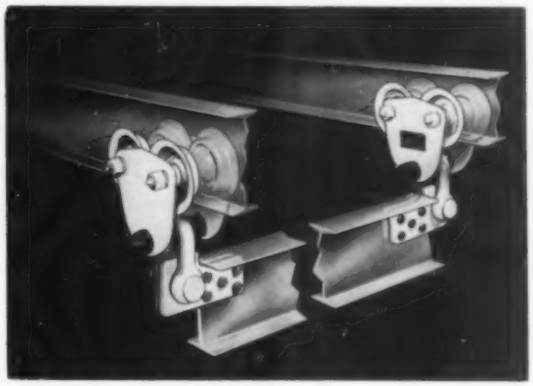
Combination pressure-reducing and relief valve for air, gas, oil, or water service controls pressure within 2 psi over entire range. Valve is single seated, spring loaded, and diaphragm actuated. Has no external actuating



connections and no stuffing box. Body is stainless steel, with bronze and Monel trim. Operates over pressure range from 0 to 2500 psi. Oil resisting Neoprene diaphragm is faced with Teflon for long uninterrupted service. ATLAS VALVE COMPANY.

701-Build your own bridge crane

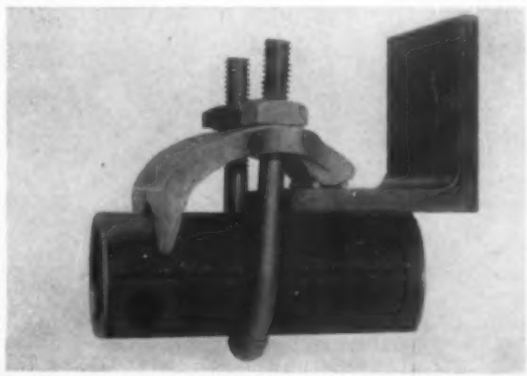
Bridge crane can be installed on standard bridge I-beams in less than two hours with new assembly kit. Each kit consists of two trolleys, two clevises with pins, two pairs of beam end plates, necessary spacing washers,



bolts, nuts, and lock-washers. Cranes will handle spans up to 25 feet and are available in capacities to 2000 pounds. Wheels are easily adjustable to operate on American Standard I-beams from 6-inch to 12-inch size. Five holes drilled in each end of the beam permit bolting the two trolleys provided to the beam ends. Provides a complete, economical crane for serving small shops, shipping docks, and loading docks that can be moved easily to other locations. SHAW-BOX CRANE & HOIST DIVISION, MANNING, MAXWELL & MOORE, INC.

702-Pipe hanger clamp installs easily

Pipe and conduit clamp is easily and securely installed to steel frames. Double bite V-shaped clamp digs into steel frame to which it is attached. Attach-



ment is made without drilling holes in the steel framework. Clamp is made in two models, one for right-angle support and one for parallel support. Available in sizes from ½ to 4 inches. FULLMAN MANUFACTURING COMPANY

703-Reseat valves with one man tool

Versatile new machine can regrind any globe or gate valve from ¼ inch to 12 inch without removing valve from line. High-speed motor and abrasive-cloth grinding elements enable one man to grind any valve seat regardless of material hardness. Single machine can be used on various size valves by changing grinding heads. Pre-

cision machine guarantees accuracy by refacing valve seats from the same reference point used by original manufacturer. Strict adherence to original reference point makes reground valve tight. LEAVITT MACHINE CO.

(more new products on page 32)

2 facts you should know about LA-CO FLUX (REGULAR) For All Soft Solders

1 NON-ACID—Safe for work and workers.

2 SELF-CLEANING—Fluxes thru rust, oil, etc.

Yes, for surer, safer, faster work LA-CO FLUX offers an unbeatable combination. Its powerful fluxing action needs no scraping or wire-brushing—provides a perfect union of solder and metal. Yet it contains no acid—will not pit, corrode or stain metals or solder or harm workers. Try it just once and you'll be enthusiastic.

LA-CO specialized fluxes available for all needs. Let our research department help on any fluxing problem, without cost or obligation.

Your supplier has LA-CO FLUX; or write for sample.

LAKE CHEMICAL CO.
3090 W. Carroll Ave., Chicago 12, Ill.

Circle 160 on READ-N-CIRCLE card for more data

DEPENDABLE! EFFICIENT! LASTING!

In every industry which employs liquids in processing, you'll find the GGU Pumps serving faithfully. Discharge may be in any of eight positions. Small amount of special metals required for handling corrosives.

STAINLESS STEEL PUMPS
We carry representative sizes of GGU and APCO Pumps in stock in type 316 Stainless Steel for prompt shipment.

WE ARE EXCLUSIVE BUILDERS OF FINE PUMPS
Our entire personnel and facilities are devoted to pump design and manufacture. PUMPS "by Aurora" recognize no superior.

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THE NEW YORK AIR BRAKE COMPANY
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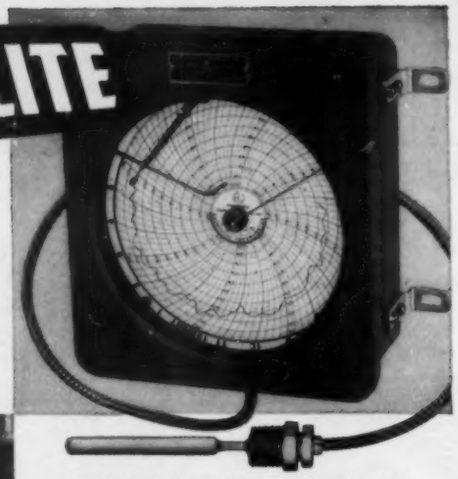
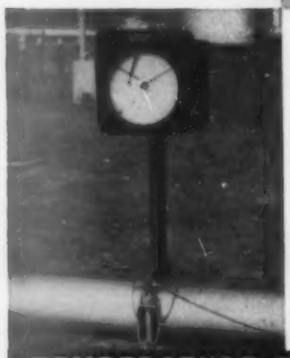
Circle 149 on READ-N-CIRCLE card for more data

AUTO-LITE

...for TEMPERATURE RECORDING...

One of the many uses for Auto-Lite Recorders is the application shown below . . . a natural gas field meter run.





Auto-Lite Model "1000" Temperature Recorder has 6" chart. Various standard ranges from minus 40° F to plus 550° F. Available for wall mounting, portable or portable self contained use. Electric or mechanical chart drive. Choice of 24-hr. or 7-day cycle. Capillary tubing permits remote reading. Priced as low as $49.50. Manufactured to customers' specifications. Send for latest Catalog describing many types of Auto-Lite Recorders and Indicators.

THE ELECTRIC AUTO-LITE COMPANY
INSTRUMENT AND GAUGE DIVISION
TOLEDO 1, OHIO
NEW YORK • CHICAGO • SARNIA, ONTARIO

TEMPERATURE RECORDERS & INDICATORS

Circle 125 on READ-N-CIRCLE card for more data

NON-FLUID OIL
TRADE MARK REGISTERED

SAVES POWER—
CUTS LUBRICATION COSTS

Here is a lubricant that stays in bearings until entirely consumed—every drop working to reduce power-wasting friction and wear. What's more, NON-FLUID OIL never dries out or forms gummy sludges.

Dripping, leaking oils won't stay in bearings, do not lubricate dependably and need frequent application.

Ordinary greases dry out or harden after a short period of time—actually becoming "dead" and losing their lubrication qualities.

What's the answer? NON-FLUID OIL! Send for a free sample and see how unique it really is—outlasts ordinary lubricants 3 to 5 times.

NEW YORK & NEW JERSEY LUBRICANT COMPANY
292 MADISON AVE., NEW YORK 17, N. Y.
WORKS: NEWARK, N. J.

WAREHOUSES

Birmingham, Ala.	Columbus, Ga.	St. Louis, Mo.
Atlanta, Ga.	Springfield, Mass.	Providence, R. I.
Charlotte, N. C.	Detroit, Mich.	Chicago, Ill.
Greenville, S. C.		Greensboro, N. C.

Also represented in other principal cities.

NON-FLUID OIL is not the name of a general class of lubricants, but is a specific product of our manufacture.

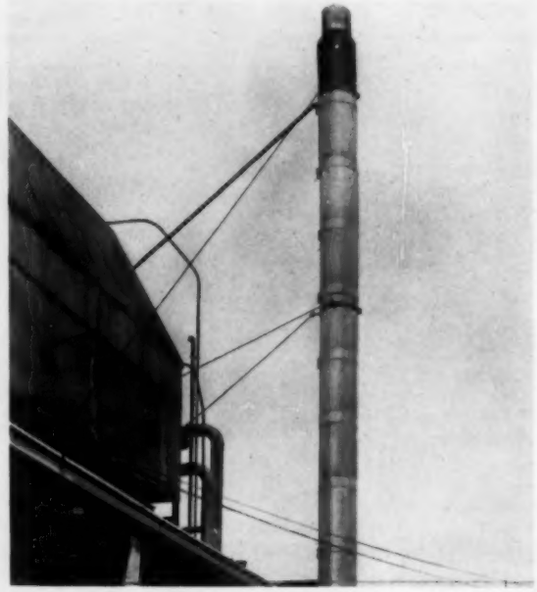
Circle 134 on READ-N-CIRCLE card for more data

new products

. . . starts on page 31

704-Prefabricated chimneys are cheaper

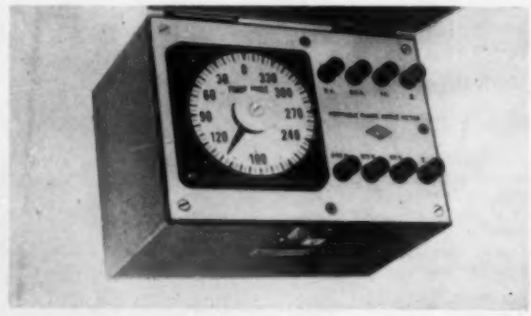
Prefabricated chimneys for use with furnaces, boilers, ovens, and incinerators cost considerably less than brick or steel chimneys. Free standing or supported chimneys are quickly and easily installed. Cast refractory lining withstands continuous flue temperatures above 1800 F.



Two-foot sections are cemented together with high temperature cement. Supports or braces are recommended every five feet throughout chimney height. Ideal for temporary or permanent jobs alike. WINNEN INCINERATOR COMPANY.

705-Phase angle meter is portable

Self-contained portable phase-angle meter requires no auxiliary equipment for operation. Meter offers a direct check on relays and instrument connections. May



be used, also, to measure prevailing power factor in each phase of a polyphase watthour meter installation with minimum hookup time. Unit has frequency of 60 cps, with voltage ranges of 60, 120, and 240. EASTERN SPECIALTY COMPANY.

You Get Things Done With Boardmaster Visual Control

★ Gives Graphic Picture of Your Operations—Spotlighted by Color
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The feather-touch with DYNAMITE ACTION!

MORE EFFECTIVE THAN EVER—MARLA AERO SPRAY PENETRATING OIL GIVES YOU THE ADVANTAGES OF:

1. SPRAY	Assures penetration, with pressure, to the most hard to get at objects. Shoots a stream three feet if needed.
2. SPEED	Always ready at the touch of a button. The fastest acting non acid, non alkali penetrating oil known or money back.
3. ECONOMICAL	Spray container eliminates wasted surplus and time in application. Cannot leak or spill.
4. HANDY	Carried easily and is always ready for use. No chance for ingredients to weaken by exposure to air from a misplaced cap.
5. VERSATILE	Marla Spray Penetrating Oil is used to free the most corroded bolts, screws, pipe threads, bearings, bushings, pulleys, manifolds valve guides, locks or any other stuck together metal parts.

INDUSTRIAL PACKAGING & PRICE SCHEDULE
F.O.B. ST. LOUIS, MO.

Case of Six—12-ounce Cans ..... $ 9.00
Case of Twelve—12-ounce Cans 17.40

Specialists in Fine Penetrating Oil for Over Thirty Years

ROTHLAN CORP. 3618 Laclede Ave. St. Louis 8, Mo.

Circle 132 on READ-N-CIRCLE card

"This Is The Best Yet!"

SAYS
D. N. Winget, Sr.
Former Chief Engineer
River Station
Cincinnati Water Works

About the Newest Model

SPEARHEAD EXTENSION GASKET CUTTER

"In 1936 we bought the first extension gasket cutter ever made. It is still in use. The other day I cut a gasket with this new model and I find the direct inch and metric scales on the cutter body make it possible to instantly set the cutter to precision sizes, and any desired diameter can be cut with the multiple use of the new extension arm. This new model is the best yet!"

•
•
•

You'll agree . . . this is the best extension gasket cutter made yet! This convenient hand tool cuts round gaskets of any size, from any pliable sheet material.

•
•
•

Smooth, Rounded Edges — for easier, more comfortable operation! Durable Tempered Steel Blades — stronger, longer lasting—quickly and easily adjusted—in a second with one easy twist of thumb screw.

•
•
•

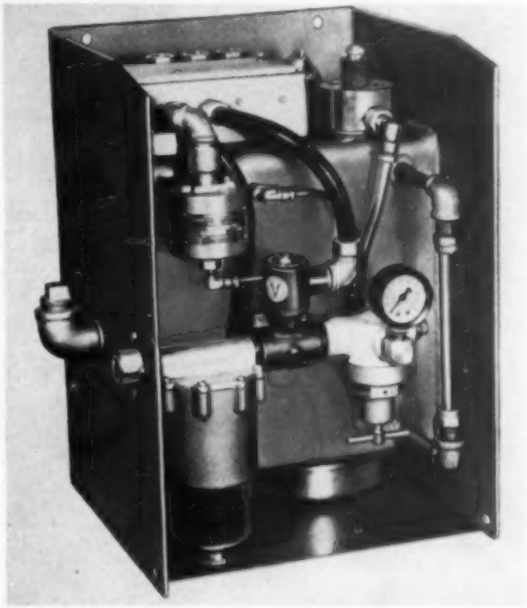
Contact your local supplier for complete information and prices, or write to . . .

ZIMMERMAN PACKING
CINCINNATI 12, OHIO

Circle 144 on READ-N-CIRCLE card

706-Get 48-hour lubrication protection

Lubrication system uses compressed air to atomize oil for continuous, efficient lubrication. Lubricates from 300 to 500 bearing inches of mechanisms while consuming only one-tenth as much oil as other methods. System



operates automatically from "on-off" switch and has no moving parts. Constant, uniform volume of fresh oil film is picked up by each bearing as needed, when needed. ALEMITE DIVISION, STEWART-WARNER CORPORATION.

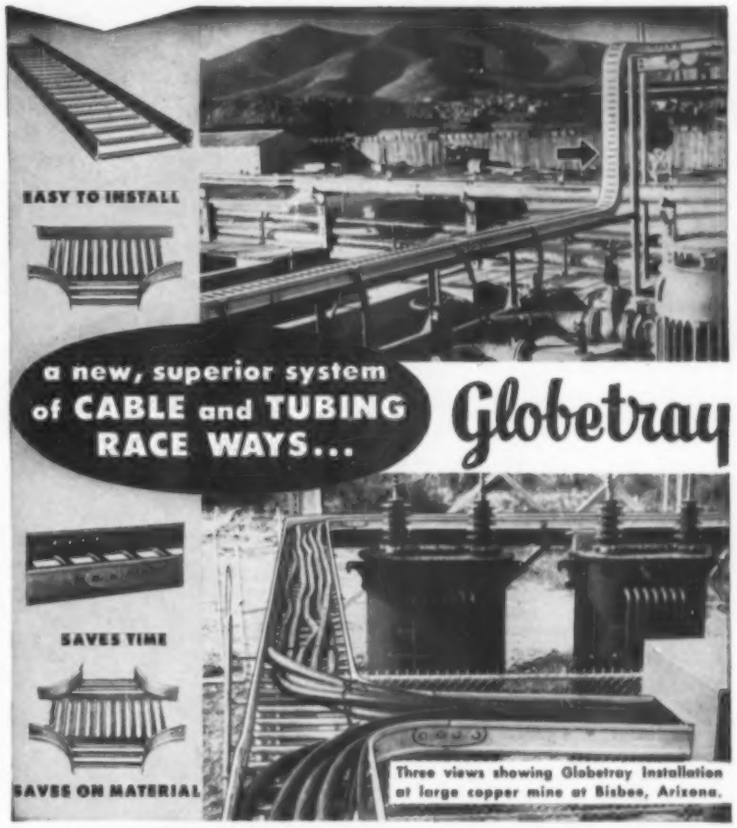
MORE INFORMATION

For more detailed free information on these products just circle the key numbers on a READ-N-CIRCLE card on page 47 or 48.

707-Air pressure charges fire extinguisher

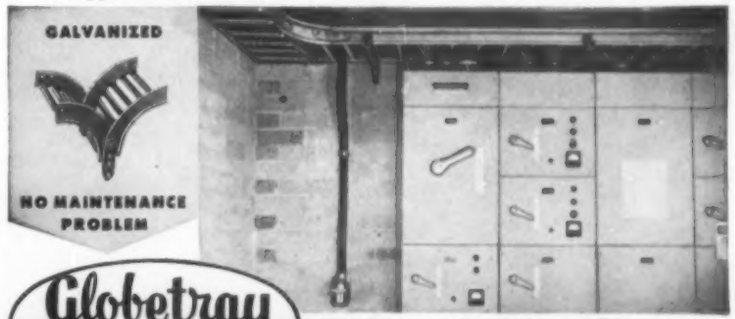
New stored-pressure water fire extinguisher can be recharged by replacing water and pressurizing unit at any 100 psig compressed air source. Extinguisher has 2½-gallon capacity and is classified 2-A by Underwriters' Laboratories. No bouncing or inverting is needed to use extinguisher. Water stream, powered by full-capacity air pressure has a range of 35 to 40 feet. Tricolor pressure gage tells at a glance whether air pressure is adequate to discharge unit effectively. Operator is able to turn off unit at will, thereby reducing water damage to a minimum. Exact control also permits operator to make most efficient use of water contained in unit. By adding antifreeze chemicals, extinguisher will operate to −40 F. Extinguisher is available in three different shells—stainless steel, brass, and chromium plated brass. ANSUL CHEMICAL CO.

(more new products on page 34)



A completely engineered system of cable ways, production produced and die formed for uniformity with up to twice the strength of ordinary trays, by actual laboratory tests. The universal splice plate joins all parts through the side channels only. All curved fittings are joined at the end of the radius (no tangent material is required) permitting continuous curves. This feature provides greater flexibility of application in tight places and creates an endless variety of combinations for a simple solution to any design problem of change of direction or elevation with a complete set of standard fittings.

Comes in 6", 12", 18" and 24" widths, in standard 12' lengths to further speed up installation time. Cable way can be cut to length at any point — insides and bottom always smooth — all sections punched for easy installation — perfect fit at all times. Neat, clean and uniform in appearance.



Globetray
THE GLOBE COMPANY

Write for new complete catalog. Distributors in all principal cities. Contact the Grip-Strut distributor under "Conduits" in the classified telephone directory.

Manufacturers Since 1914 The GLOBE Company
4036 S. PRINCETON AVE. • CHICAGO 9, ILL.
Circle 106 on READ-N-CIRCLE card for more data

pd

Decantation Principle

- reduces tube erosion
- separates large particles
- collects smaller particles

This basic P-D principle provides a unique system that separates large, high-carbon particles for refiring, and small flyash particles for disposal. And a decantation system can be installed for a very small additional cost, no additional area or pressure drop and very little added height. Features unique patented *PLENAFLO internal ducting.

Larger particles with sharp coke and cutting edges are the primary eroding elements of flue dust. These are primarily skimmed off before the dust-laden gas enters the tube and returned for refiring.

The Thermix Corporation are project engineers for Prat-Daniel. Contact them on this unique collector system. They will also be glad to give you information on P-D Standard Tubular Dust Collectors, Fan Stacks, F.D. and I.D. Fans and other components.

Write today for catalog. See the advantages of PLENAFLO.

*Trademark

Project Engineers

THE THERMIX CORPORATION

GREENWICH, CONN.

(Offices in 38 Principal Cities)

Canadian Affiliates: T. C. CHOWN, LTD., Montreal 25, Que.

Designers and Manufacturers

PRAT-DANIEL CORPORATION

SOUTH NORWALK, CONN.

POWER DIVISION: Tubular Dust Collectors, Forced Draft Fans, Air Preheaters, Induced Draft Fans, Fan Stacks

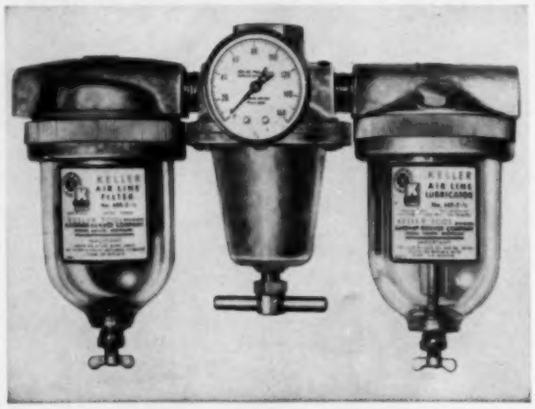
Circle 100 on READ-N-CIRCLE card for more data

new products

. . . starts on page 31

708-Multipurpose unit for air lines

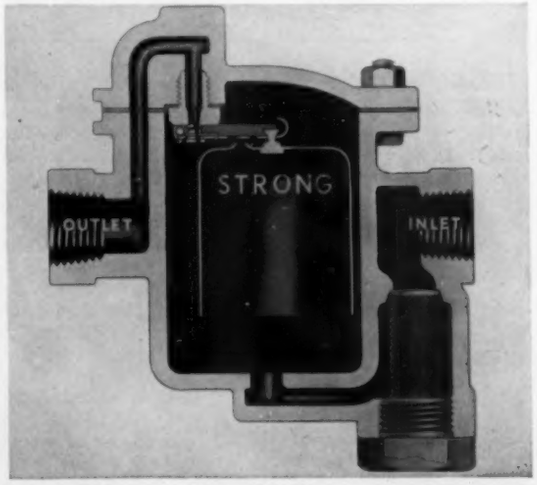
New air line filter, regulator, and lubricator performs all these three functions for your air-driven equipment. Unit drains from bottom without removing bowl. Pressure regulator operates in an inverted position to permit



more compact, space-saving installation. Regulator gage has unbreakable face. Units are available in any combination or as individual units for ⅜-inch, ½-inch, or ¾-inch compressed air lines. Exterior surface of all units is finished in hammerloid gray. KELLER TOOL DIVISION, GARDNER-DENVER COMPANY.

709-Built-in strainer prevents clogging

Built-in strainer prevents clogging and reduces cleaning maintenance time on this steam trap. Strainer screen is installed vertically for easy removal and cleaning.



Strainer on inlet side catches foreign matter. Traps are suitable for working pressures up to 150 psig. Inlet and outlet tapped hole sizes are ½ inch and ¾ inch. STRONG STEAM SPECIALTIES DIVISION, STRONG, CARLISLE & HAMMOND CO

CHROMALOX

Electric

TUBULAR HEATERS

provide controlled and dependable conduction, convection or radiant heat

These versatile Chromalox Tubular Heaters provide the kind of heat you need, exactly fitted to your specific heating application.

Available in straight lengths or formed to any desired shape. Used for heating dies, molds, platens; as immersion heaters in liquids, soft metal and molten salts; or in ovens, air ducts and other air heating applications.

Let the Chromalox Sales Engineering staff solve your heating problems . . . electrically

Write for your copy of Catalog 50

—for full information on the complete line of Chromalox Electric Heaters and controls.

For ideas on additional applications of electric heat, request Booklet F1550—"101 Ways to Apply Electric Heat."

Edwin L. Wiegand Company

7520 Thomas Boulevard, Pittsburgh 8, Pennsylvania

EDWIN L. WIEGAND COMPANY
7520 Thomas Boulevard, Pittsburgh 8, Pa.
I would like to have . . .

☐ a copy of Catalog 50
☐ a copy of "101 Ways"
☐ a Sales Engineer contact me.

Name_____
Company_____
Street_____
City_____ Zone____ State_____

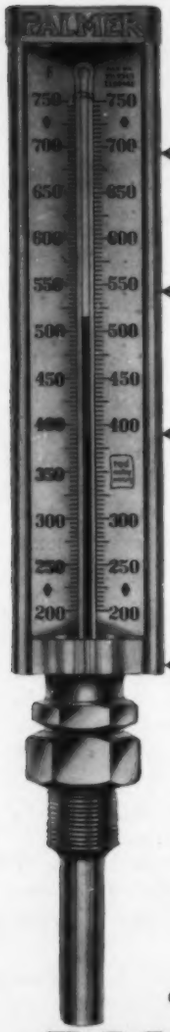
A-4466A

Circle 119 on READ-N-CIRCLE card

Today's Modern Industry
Demands a Modern Thermometer

PALMER

RED-READING MERCURY THERMOMETERS



Red-Reading Mercury

Extruded Brass Case

Chrome Finish

Ranges −40 to 950°F or Equivalent in °C

Write for Complete Information

Ask for Bulletin No. 35

Consult your Classified Directory

PALMER

THERMOMETERS, INC.
Mfrs. of Industrial Laboratory, Recording and Dial Thermometers
Cincinnati 12, O.

Circle 127 on READ-N-CIRCLE card

710-Portable fire where you need it

Oil-burning utility torch for heating, drying, melting, thawing, and burning has automatic safety pressure check in every unit. When required, operating air pressure is pumped into fuel tank. No additional pressure can be built up with hand-operated pump. Powerful,

lightweight, inexpensive torch sets new operating and safety standards for maintenance and all-purpose utility. Unit, burning kerosene or light fuel oil, produces a smokeless, controlled 2000 F flame. HAUCK MANUFACTURING COMPANY.

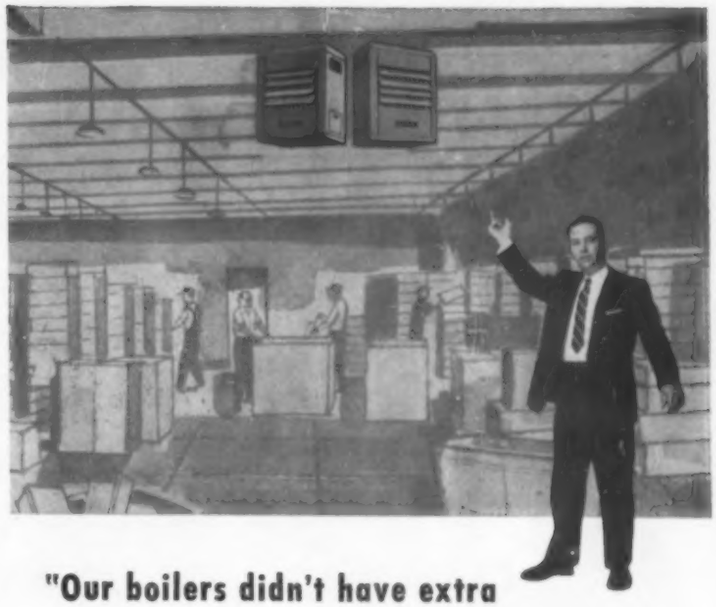
MORE INFORMATION

For more detailed free information on these products just circle the key numbers on a READ-N-CIRCLE card on page 47 or 48.

711-Heat exchanger is small but mighty

Special heat exchanger contains 540 sq ft of heating surface and occupies only 7.2 cu ft. Unit heats 3000 cu ft of vapor per minute, using 450-psig steam. Each finned-

tube coil bank is separated by a rolled steel cylinder to provide baffling and support for the coils. SCHUTTE AND KOERTING COMPANY. *(more new products on page 36)*



"Our boilers didn't have extra capacity to handle this plant addition—Reznor heaters were the perfect solution"

"When we completed this new plant addition, our boilers weren't able to take the additional heating load. It wasn't going to be economical to add another boiler, or to replace one of our boilers with a boiler of larger capacity. Reznor heaters were the perfect solution for our problem. Eighteen 150,000 BTU Reznor heaters give us the required capacity and they maintain even, comfortable temperature throughout the new section of the plant. Installation costs were surprisingly low. Operating costs have been less than that for the same capacity from the steam system, and we've had absolutely no maintenance work to do. When our present boilers need replacement, we'll probably switch the whole plant to Reznor gas unit heating."

Only Reznor Gas Unit Heating Offers All These Advantages

- Low Equipment Cost
- Low Installation Costs
- Low Operating Costs
- Instant Response to Every Change in Temperature
- No Maintenance Problems
- Wasts No Floor Space
- Extra Heat for Trouble Spots
- Complete Adaptability to Future Construction

For more information mail the coupon below or call your nearby Reznor distributor. He's listed under "Heaters-Unit" in the yellow pages of your telephone directory.

REZNOR
THE WORLD'S LARGEST-SELLING GAS UNIT HEATERS

REZNOR MANUFACTURING COMPANY
70 Union Street, Mercer, Pa.

☐ Please send me my free catalog on Reznor gas heating equipment.
☐ Please have a representative call to discuss our plant heating problems.

Name..... Title.....
Company.....
Street.....
City..... State.....

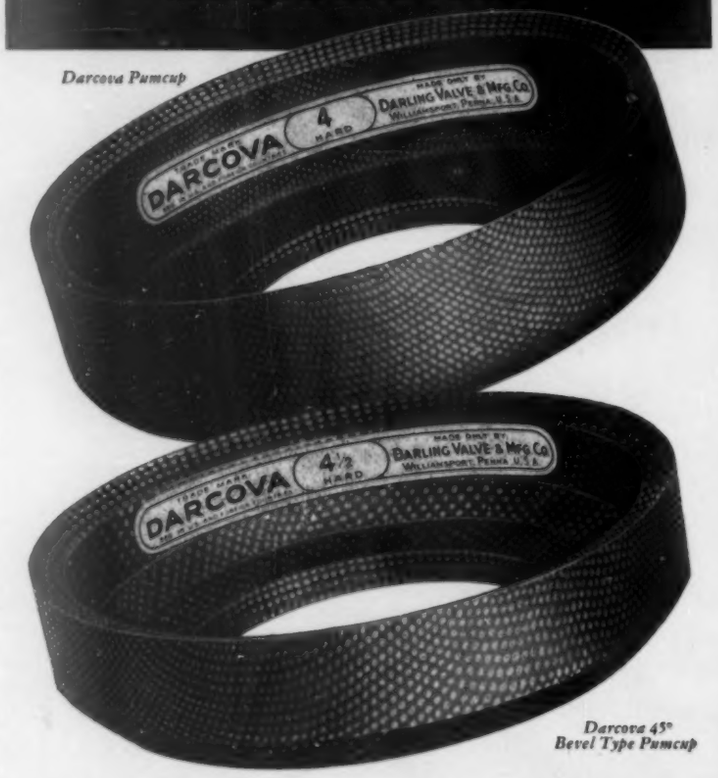
Circle 103 on READ-N-CIRCLE card for more data

DARCOVA PUMCUPS

now available with

100% NYLON COMPOSITION

for HYDRAULIC CONTROLS, AIR CYLINDERS, RECIPROCATING PUMPS



Darcova 45° Bevel Type Pumcup

DARLING Pumcups—long noted for unequalled efficiency and life in all kinds of cylinders—are now greatly exceeding their own performance records! The new 100% Nylon Composition, available *only* in Darcova Pumcups, does it!

Nylon Pumcups are made in sizes, types and textures exactly right for your particular equipment—ready *now* to give you unprecedented piston packing performance!

Write for helpful data Bulletin No. 5503.

DARLING VALVE & MANUFACTURING CO.

Williamsport 9, Pa.

DARCOVA THE ORIGINAL COMPOSITION CUP

TRADE MARK PUMCUPS

Circle 139 on READ-N-CIRCLE card for more data

new products

. . . starts on page 31

712-Warning light flashes for attention

Remote-reading liquid-level gage produces flashing red light to emphasize warning. Positive visual warning signals immediately if boiler water level drops below

safe limits. Gages may be equipped with signal horn to supplement flashing red signal. Under normal operation, the scale is illuminated with white light for easy visibility from any position in the boiler room. JERGUSON GAGE & VALVE CO.

713-All-purpose plastic insulation

New plastic insulation material is recommended where easy workability and tight adherance is required. Material is recommended for temperatures up to 1800 F. Has low thermal conductivity. It is abrasion-, vibration-, impact-, and rust-resistant. Laboratory tests show that new product is waterproof and will not shrink. Recommended for boiler drums, breechings, burner casings, economizers, heat exchangers, hot air lines, and steam pumps. J. H. FRANCE REFRACTORIES CO.

714-Circuit breaker for dual voltage

Dual-rated circuit breaker protects equipment designed to operate on two different voltages. Circuit breaker ratings are unaffected by ambient temperature. Dual-rated units are available with one of three inverse

time-delay characteristics or in an instantaneous-trip form. Maximum operating voltage is 480-volts ac, 125-volts dc. HEINEMANN ELECTRIC COMPANY.

HOW YOU SAVE...

. . . getting drier Compressed Air

● Save the cost of cooling water and you save the price of the Niagara Aero After Cooler (for compressed air or gas) in less than two years.

Extra, for no cost, you get drier compressed gas or air for your process. You get better operation and lower costs in the use of all air-operated instruments, machines, or paint sprays. You save expense for piping, pumping, water treatment and disposal. You get the use of badly needed water elsewhere in your plant.

Niagara Aero After Cooler cools compressed air or gas (evaporatively) below the temperature of surrounding atmosphere, with no further condensation in your air lines.

Write for complete information; ask for Bulletin No. 130, or contact nearest Niagara Engineer if you have any problem involving the industrial use of air. Address Dept. IP

NIAGARA BLOWER COMPANY

405 Lexington Ave., New York 17, N.Y.

District Engineers in Principal Cities of U.S. and Canada

Circle 111 on READ-N-CIRCLE card

Full 180° Visibility Accuracy to ½ of 1%

You get full 180° visibility with the new Jerguson Truscale Gages with the Convex Scale. Scale markings are directly on the convex face and the indicator goes clear around the convex surface. You can bring your liquid level down to the control room floor, or other remote point . . . and can see it from anywhere in the room . . . can check a whole line-up of Truscales with one look from any point.

Truscale is really accurate too . . . sensitive to ½ of 1% of scale reading. Simple trouble-free construction. Available with signal horns, lights and up to six repeaters for other auxiliary points.

New design boiler water gage gives maximum visibility

Jerguson's unique offset single piece gage chamber gives you more inches of visibility with no blind spots. Special valve with horizontal loop keeps the strain off the gage under varying conditions of expansion and contraction.

Send for complete data on Jerguson Convex Scale Truscales . . . and Boiler Water Gages.

JERGUSON

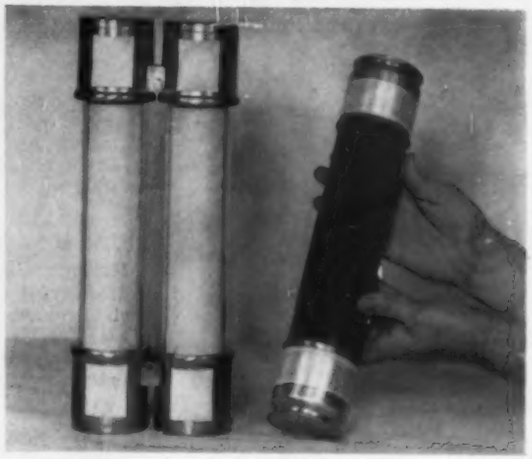
Gages and Valves for the Observation of Liquids and Levels

JERGUSON GAGE & VALVE COMPANY
100 Fellsway, Somerville 45, Mass.
Offices in Major Cities
Bailey Meters & Controls, Ltd., London, Eng.
Controle Bailey, Paris, France

Circle 126 on READ-N-CIRCLE card

715-Ribbon element limits fuse current

New ribbon-element current-limiting fuse is available for motor starter applications. Fuse consists of silver element surrounded by dry, inorganic quartz sand. It



is enclosed in a strong insulating tube and connected to the circuit by copper ferrules on each end of the tube. Higher continuous-current rating is available with the new unit. GENERAL ELECTRIC COMPANY.

MORE INFORMATION

For more detailed free information on these products just circle the key numbers on a READ-N-CIRCLE card on page 47 or 48.

716-Handy resuscitator for emergencies

All-purpose resuscitator is dependable, simple to operate, and can be carried by one person. Resuscitator automatically inhales and exhales for patient being treated and adjusts to his lung capacity. Mask can be easily removed and sterilized in boiling water. Mechan-

ism can be used 200 feet away from oxygen supply. Tough aluminum alloy carrying case is impervious to moisture, grease, and stains. Case accommodates two standard oxygen cylinders and weighs 26 pounds without cylinders. Portable resuscitator can often avert tragedy in emergencies. NATIONAL CYLINDER GAS COMPANY.

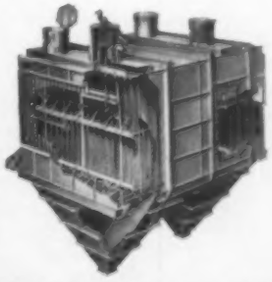
% Fractional Efficiency
99 + Per Cent For 100 Mesh & Larger
LOW RESISTANCE COLLECTOR
325 Mesh
200 Mesh
Fly Ash Size in Microns

Buell "LR" Fly Ash Collectors Deliver Top Efficiency on Natural Draft!

Buell "LR" units have no moving parts to get out of order, require no cleaning or water, yet collect *over* 99% of fly ash 100 mesh or larger, even on natural draft! Simple design gives minimum draft resistance, plenty of extra capacity to handle overloads. It's the perfect fly ash collector for high or low pressure boilers from 100 to 2,000 BHP!

BUELL CYCLONE COLLECTORS also deliver extra efficiency, owing to exclusive Shave-off which harnesses the double-eddy and puts it to work!

WRITE FOR FREE BROCHURE giving complete design and performance data on the Buell "LR" Fly Ash Collector. Write to Dept. 90-5, Buell Engineering Company, 70 Pine Street, New York 5, N. Y.



BUELL "SF" ELECTRIC PRECIPITATOR with exclusive Spiralectrodes and Continuous Cycle Rapping deliver the valuable extra percent of efficiency.

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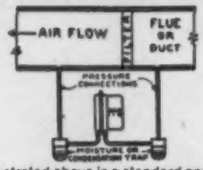
MECHANICAL ELECTRICAL

Experts at delivering Extra Efficiency in
DUST COLLECTION SYSTEMS

Circle 101 on READ-N-CIRCLE card for more data

CONTROL FROM MINUTE CHANGES IN THE RELATIONSHIP OF TWO PRESSURES



Illustrated above is a standard application whereby the Type PPQ functions to open (or close) an electrical circuit from a variation in pressure differential due to a clogging filter.

Mercoid Type PPQ Diaphragm Differential Pressure Controls operate from minute changes (.03" water) in the difference between two pressures.

Ranges to cover most applications (inches of water) 6" vacuum to 6" pressure, and 30" vacuum to 30" pressure. Available for various circuit arrangements.

Electrical Capacity—0.3Amp. at 115V., A.C. or 0.15 Amp., at 230V., D.C. Can be furnished in explosion-proof or weather-proof cases.

WRITE FOR BULLETIN CA-3P

THE MERCOID CORPORATION
4205 W. BELMONT AVENUE, CHICAGO 41, ILLINOIS
New York: 206 East 42nd St. Philadelphia: 3137 N. Broad St.

Circle 130 on READ-N-CIRCLE card for more data

detect O_2 in FEED WATER

Continuous records of the oxygen dissolved in boiler feed water and of the hydrogen entrained in steam, indicate when corrective measures are necessary to prevent otherwise unsuspected and costly corrosion. Cambridge Analyzers measure and record dissolved oxygen directly. The hydrogen in the steam is measured and indicates the quantity of oxygen set free by dissociation. Cambridge Instruments are available for continuously recording either O_2 or H_2 separately, or O_2 and H_2 simultaneously.

Send for Bulletin 148 B. P.

CAMBRIDGE
INSTRUMENT CO., INC.
3524 Grand Central Terminal, New York 17, N. Y.
Pioneer Manufacturers of Precision Instruments

Circle 131 on READ-N-CIRCLE card for more data

new bulletins

. . . just circle key numbers on READ-N-CIRCLE card on pages 47 or 48

400-How to install pressure pipe

Manufacturer's recommendations for installing "Transite" pressure pipe to meet all conditions are contained in Bulletin TR-180A. Describes and illustrates details including loading and unloading, machining and cutting, flange installation, and supporting. Includes dimensional data and pipe weights in sizes from 4 through 16 inches. Also includes complete list of fittings and connections. Forty-eight pages. JOHNS-MANVILLE.

401-Bearing engineering manual

Complete data on Oilite bearings is contained in Bulletin E-56. Lists Brinell and Rockwell ratings with industrial applications for all materials. Describes over 1000 standard sleeve, flange, and thrust bearings available for shipment. Fifty-two pages. AMPLEX DIVISION, CHRYSLER CORPORATION.

402-Interlocked armored cable data

Bulletin 19-555 contains complete data on interlocked armor cable designed specifically for primary and secondary feeders in industrial power distribution systems, generator leads, station auxiliaries, and station control cables. Lists cable with five different insulation materials and with steel, aluminum, and bronze armor. Eighteen pages. GENERAL ELECTRIC COMPANY.

403-Air control valve catalog

Here's your opportunity to get application data on a complete line of two-, three-, and four-way air control valves for high- or low-pressure installations. Covers flow-control, interlocking, pilot, pressure-regulator, time-delay, and booster valves. Includes single- and double-acting cylinders for air or hydraulic use. Seventy-two pages. AIRMATIC VALVE, INC.

404-Automatic valve selection charts

Engineering data, flow charts, operating details, and illustrations of two-, three-, and four-way solenoid valves are included in Catalog 201. Unique selection chart enables you to quickly choose correct valve. Includes data on air, gas and steam flow. Thirty-two pages. AUTOMATIC SWITCH CO.

405-Packing and gasket buyers' guide

Catalog P-200C describes packing rings, piston cups, gaskets, braided and plastic packings, and asbestos sheet packing. Includes specifications on all packing types with corresponding manufacturer's number. Forty pages. RAYBESTOS-MANHATTAN, INC.

406-Protective coatings bulletin

Bulletin 760 presents charts, tables, diagrams, and illustrations showing all factors relating to the use of protective coatings. Discusses surface preparation, priming, application methods, and maintenance instructions. Lists protective coatings for mild and severe corrosive service. Includes table giving chemical resistance rating of each coating to over 200 corrosive agents. Describes method of priming rusty surfaces without previous surface preparation. Thirty pages. U. S. STONEWARE COMPANY.

407-How to get rid of dirty birds

Having trouble with pestiferous dirty birds? This bulletin describes how to use tape recorded starling distress call to successfully rid buildings of these birds. Includes illustrated case histories that document results obtained in eliminating these pests. Twelve pages. MOHAWK BUSINESS MACHINES CORP.

408-Insulated piping practices

Insulated pipe units for handling all power, utility, and process media are described in Bulletin 56-1. Describes connections, trench widths, recommended insulation, and pipe clearances. Gives factory prefabricating methods that minimize installation time and cost. Twenty-four pages. RIC-WIL INCORPORATED.

409-Meter and control application summarized

Over 100 measuring, transmitting, receiving, recording, indicating, and control instruments are described in Bulletin G15-1. Recommends applications for power and process industries. Lists 24 specific instrument and control applications with advantages obtained. Eight pages. BAILEY METER COMPANY.

410-Diagnose your compressor troubles

Helpful aids to locate and correct common air-cooled and water-cooled compressor troubles are contained in Bulletin PC-509P. Cartoon sequence gives full description of compressor troubles and solutions. WORTHINGTON CORPORATION.

411-Boiler instrumentation data

Boiler instrumentation for stoker-fired, gas-fired, oil-fired, and pulverized-coal-fired boilers are described in Bulletin 55-605-83. Schematic diagrams show instrumentation hookup for each fuel type. Shows eight examples. Twenty-four pages. THE HAYS CORPORATION.

412-Power transmission data

Bulletin 2653 contains illustrations showing how Link-Belt power transmission equipment serves every industry. Illustrations show conveyors, chain drives, bearings, gears, and complete line of accessories. Lists additional technical literature for information on specific subjects. Forty-four pages. LINK-BELT COMPANY.

413-Condensed valve bulletin

Complete line of valves for boiler room, petroleum, and industrial service are described in Catalog 105. Includes screwed, flanged, and welding-end valves in working pressure ranges up to 7500 psi WOG. De-

NATIONAL AIROIL

Oil Burners

OF THE STEAM AND MECHANICAL TYPES NOW COMBINED INTO

Dual Stage BURNERS

Now, at last, the inherent advantages of *both* systems of fuel oil atomization are *profitably* yours . . . within the one, new NATIONAL AIROIL Dual Stage Burner.

45 years of combustion equipment design and manufacture are in back of the Dual Stage Oil Burner . . . and, it has been thoroughly tested and proved in the field for firing: Petroleum Processing Heaters; Rotary Kilns; H.R.T., Scotch Marine and Water Tube Boilers; etc.

Available in three sizes, the NATIONAL AIROIL Dual Stage Burner fires all grades of fuel oil from No. 2 to No. 6, with a ready capacity of 80 to 300 g.p.h. Further, for a perfect flame pattern, we would recommend using with the Dual Stage Burner either the NATIONAL AIROIL Universal Register for forced draft or, the NATIONAL AIROIL Tandem Unit for natural or induced draft furnaces.

Get detailed description, illustration, and specifications in NATIONAL AIROIL Bulletin 25.

OIL BURNERS and GAS BURNERS for industrial power, process and heating purposes
STEAM ATOMIZING OIL BURNERS
SLUDGE BURNERS, Steam Atomizing
MOTOR-DRIVEN ROTARY OIL BURNERS
MECHANICAL PRESSURE ATOMIZING OIL BURNERS
DUAL STAGE, combining Steam and Mechanical Atomization
LOW AIR PRESSURE OIL BURNERS
AUTOMATIC OIL BURNERS, for small process furnaces and heating plants
GAS BURNERS
COMBINATION GAS & OIL BURNERS
FUEL OIL PUMPING and HEATING UNITS
FURNACE RELIEF DOORS
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1350 E. Sedgley Ave., Philadelphia 34, Pa.
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scribes construction features of globe, gate, angle, and check valves. Gives valve dimensions for butt welding to nominal pipe sizes from 2½ inch to 16 inch. Thirty-two pages. EDWARD VALVES, INC., Subsidiary of ROCKWELL MANUFACTURING COMPANY.

414-Aluminum handbook

"Alcoa Aluminum Handbook" describes complete line of aluminum forms, alloys, and physical properties. Ten sections cover aluminum fabrication into sheet, plate, wire, rod, tubular goods, electric conductor, structural shapes, and forgings. Includes tabular data on physical and chemical properties of all well-known alloys. 176 pages. ALUMINUM COMPANY OF AMERICA.

415-Spray lubrication system data

Complete data on spray lubrication systems for open gearing and slide surfaces are contained in Bulletin 60-A. Describes manual and automatic systems with component equipment and gives schematic layouts. Describes typical piping installation with operating sequence. Eight pages. THE FARVAL CORPORATION.

416-Multipurpose bearing manual

Bearings for every purpose — including roller, ball, and sleeve bearings — are described in Bulletin A-638A. Contains data on bearings from 1 3/16 inch through 12 inch id. Describes pillow blocks, flange-type bearings, bearing takeups, and bearing hanger units. Seventy-two pages. DODGE MANUFACTURING CORPORATION.

417-Toolroom grinding handbook

This booklet, Form 781, covers information on general tool grinding, carbide tools, and cast alloy tools. Up-to-date methods shown make this handbook ideal for all toolroom use. Excellent closeup illustrations show actual grinding procedures. 222 pages. NORTON COMPANY.

418-Coal crushing handbook

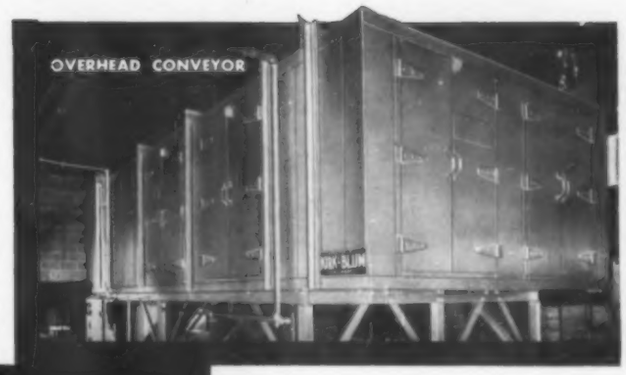
Coal crushing from "A" to "Z" is explained in this bulletin. Includes description of all crusher types and gives results obtained. Lists 13 check points to consider when selecting a crusher. Includes cross section illustrations of each crusher type. Tabular data are included giving capacities of many common crushers. Forty pages. PENNSYLVANIA CRUSHER DIVISION, BATH IRON WORKS CORPORATION.

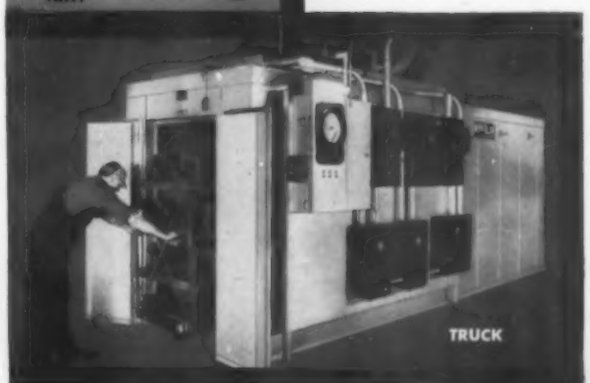
419-Raceway installation guide

Step-by-step raceway installation details are illustrated in Bulletin 18-166. Includes recommendations for obtaining maximum protection and efficiency from plastic-coated rigid steel conduit and metallic tubing. Lists clamps, hangers, and shows correct method of taping couplings. Fourteen pages. GENERAL ELECTRIC COMPANY.

420-Tramrail application data

Principal components of overhead materials handling systems are covered in Booklet 2008-M. Includes formulas and comparative data on various track sections. Discusses carriers for hand, electric and automatic operation, tractors, track switches, and standard, transfer, and gantry cranes. Also discusses safety electrification, buckets, and grabs. Twelve pages. CLEVELAND TRAMRAIL DIVISION, CLEVELAND CRANE & ENGINEERING CO. ♦♦





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Your oven needs . . . large or small, batch or conveyorized production, for drying, baking or dehydrating . . . can be filled by KIRK & BLUM.

Compactly designed and expertly engineered to meet specific requirements, these typical installations show the wide range of KIRK & BLUM experience over more than 50 years. Often, ovens up to freight car size are shipped assembled, ready to operate.

Put this skill and experience to work on your industrial oven problem. For complete information and booklet, write: The Kirk & Blum Mfg. Co., 3174 Forrer St., Cincinnati 9, Ohio.

KIRK & BLUM INDUSTRIAL OVENS

Circle 108 on READ-N-CIRCLE card for more data

basic bulletins

. . . just circle key numbers on READ-N-CIRCLE card on pages 47 or 48

AIR CONDITIONING, HEATING, VENTILATING

501-Gas-fired heaters save space

Advantages of gas-fired commercial and industrial heating units are fully described in Catalog GN-56. Includes data on suspended gas unit heaters, both fan and blower types, in capacities from 25,000 to 250,000 Btu. Lists specifications, construction details, easy-to-read dimension drawings, and selection tables. Twenty-four pages. REZNOR MANUFACTURING COMPANY.

BOILERS AND BOILER ACCESSORIES

502-Do your own boiler survey

Here's how to get a boiler survey form without obligation. Write for this bulletin covering the new CB self-contained boiler. Illustrations of installations, cutaway views of the boiler, and articles on how the units have proved themselves in specific applications are included. Four pages. CLEAVER-BROOKS CO.

503-Blowoff heat is free heat

Recover practically all of the heat of the blowoff water in a continuous blowoff system. Bulletin 5700 uses diagrams and text to explain how this steam may be used to heat feedwater in an open or deaerating heater and how it may be condensed in a closed heater or flash condenser to heat feedwater.

504-Boiler instrumentation data

Modern power plant instruments and control systems are described with the aid of photographs and schematic drawings in Bulletin 55-605-83. Combustion instruments and panels are treated in detail. Twenty-four pages. THE HAYS CORPORATION.

505-Handbook on startup

Handbook covers washing out new boiler, putting it in operation, handling in service, firing methods, and shut down. Includes big section of everyday engineering data. Forty-eight pages. TITUSVILLE IRON WORKS CO.

BUILDING CONSTRUCTION, MATERIALS

506-How to build better masonry

Recommended practice covering materials, proportioning, mixing, and laying of units is offered in Bulletin WP6.5535M. Three essentials to better masonry and four essentials to better mortar are given with quantity reference tables. Twenty-four pages. UNIVERSAL ATLAS CEMENT COMPANY.

507-More for your lumber dollars

How to get more value for your lumber dollar is explained in this illustrated booklet. Classifications of softwood and hardwood lumber by trees, manufacture, use, size, and grade is thoroughly explained. A valuable booklet about this versatile material. Twenty-four pages. NATIONAL LUMBER MANUFACTURERS ASSOCIATION.

COMMUNICATIONS SYSTEMS

508-How to select industrial signals

Three major factors in signal selection are discussed in this bulletin: purpose of signal; areas to be covered; and noise levels to be overcome. Discusses general alarm, start and dismissal, coding or paging, and danger signals, for outdoor and indoor areas. Condensed chart shows range for each signal type. Eight pages. FEDERAL SIGN & SIGNAL CORPORATION.

CORROSION CONTROL

509-Newest paints described

"Subox and Subalox Anti-Corrosive Paint—30th Anniversary," replaces the 25th anniversary issue you have in your files. It covers these paints as previously made and includes the newer varieties. Case histories show successful use of Subox paints on various types of industrial equipment. SUBOX, INC.

ELECTRIC DISTRIBUTION

510-Transformer engineering data

Engineering manual on distribution transformers, Bulletin 136, contains performance data charts, dimensions, and weights for single-and-three-phase transformers, both oil-and askarel-filled. Includes data on terminal details, arrangements, and testing and inspection practices. Sixteen pages. R. E. UPTEGRAFF MANUFACTURING COMPANY.

511-Cable selection chart

Comprehensive selection chart for insulated electric cable is included in Bulletin 1096. Lists minimum standard industry specification requirements for each insulation and covering. Describes trade name insulations, their limitations, and correct installation methods. Excellent reference for engineers concerned with purchase and use of electrical cable. Sixteen pages. THE OKONITE COMPANY.

512-Correct that low power factor

Booklet 50B, describes unit-cell box type capacitors which offer easy-to-install, economical means of correcting low power factor for large or small power consumers. Twenty-seven pages. SPRAGUE ELECTRIC CO.

513-New variable transformer ratings

Types 136 and 236 Powerstat variable transformers—design, new ratings, and performance—are discussed in eight-page Bulletin P354. THE SUPERIOR ELECTRIC CO.

514-Outdoor service equipment guide

Designed to make easier the selection of outdoor service equipment, Bulletin 2016 combines descriptive data

There's a heavy conveying system atop these Neff and Fry Bins

A continuous reinforced concrete roof on the six 20' x 52½' bins carries a big screw conveyor with piers, chutes, etc. Observe that there are no additional supports from the ground. The bins themselves support the entire load.

This strikingly proves the load-bearing strength of Neff & Fry Bins. Of course, the bins also have the lateral strength to contain 4,000 tons of grain.

The walls of Neff & Fry Bins are constructed of Super-Concrete Staves. For a complete understanding, read our folder, "Bins With the Strength of Pillars." Ask for it now before you forget.

NOT EXPORTED
EXCEPT TO CANADA AND MEXICO

THE NEFF & FRY CO.
120 ELM ST. • CAMDEN, OHIO

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BASIC BULLETINS

SUBJECT INDEX

Air conditioning, heating, ventilating 40
Boilers and boiler accessories ..40
Building construction, materials 40
Communications systems 40
Corrosion control 40
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Maintenance items 42
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Piping, tubing, and hose 43
Pumping equipment 43
Refractories and insulation 44
Traps, strainers, and separators 44
Vibration and noise control 44
Water supply and treatment 45

on all available standard equipment—service entrance, receptacle type, dual control, three-phase units. Twelve pages. HEINEMANN ELECTRIC CO.

515-Guide to planning bus duct

Latest concepts of bus enclosure for generator leads and switching stations are given in Bulletin 10004-A. Includes guide of electric characteristics, ring size, working data, physical arrangement, and isometric installation layout. Gives recommendations for strength and simplicity for welded bus. Eight pages. I-T-E CIRCUIT BREAKER COMPANY.

516-Transformer connection diagrams

Diagrams and explanations of transformer power and lighting connections are offered in Bulletin CS-102. Common single-phase applications are covered. Also includes typical connections demonstrating the importance of open delta or wye hook-ups during emergencies. Eight pages. KUHLMAN ELECTRIC COMPANY.

ELECTRIC UTILIZATION

518-Answers to hot water problems

Answers to your hot water problems are given in Booklet "Methods and Means." Operation and advantages of the instantaneous water heater as compared to the indirect method heater are thoroughly discussed and illustrated. PICK MANUFACTURING CO.

FUELS AND FIRING EQUIPMENT

519-Stokers are more flexible

Stokers for bituminous coal and anthracite are described in Bulletin 553. Complete specifications and ratings are included. Photographs and drawings of side ash dumps are also given. Twelve pages. CANTON STOKER CORPORATION.

520-Industrial heating handbook

New handbook provides plant engineers with basic concepts of industrial heat processing and heat control. Pruned of technical language, the handbook goes from a discussion of heat-to-fuel cost comparisons to design elements. Common formulas used in calculating heat and oven requirements are included. Bulletin 555—a refresher course in process heating—is a must for all plant engineers. Twenty pages. MICHIGAN OVEN COMPANY.

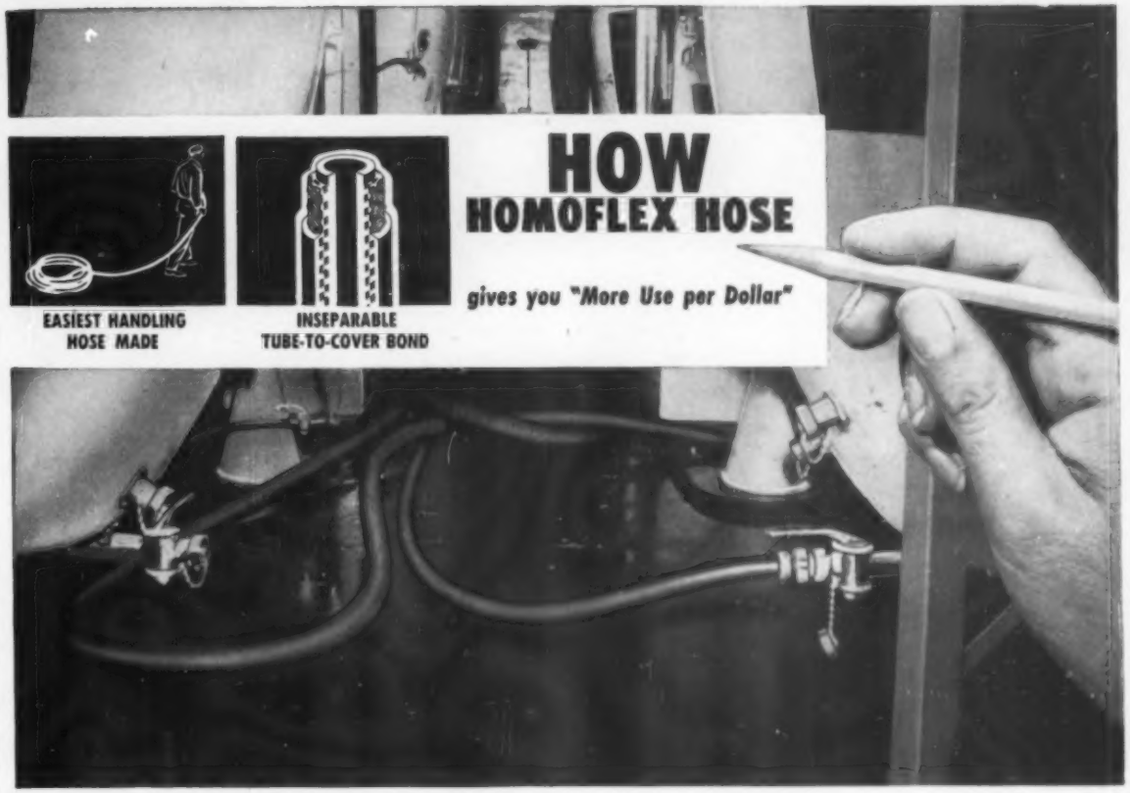
INSTRUMENTS AND CONTROLS

521-How to select thermocouples

Theory and uses of thermocouples are discussed in Bulletins 1601, 2, 3, and 4. Thermocouple circuits and metals, immersion length, protecting tube, junctions, extension leads and terminal connectors are discussed in detail. Recommended operating temperatures and resistance tables are included for most commonly-used thermocouples. Gives installation data for measurement of liquid, gas, and surface temperatures. Fourteen pages. REVERE CORPORATION OF AMERICA.

522-Temperature conversion chart

Handy two-color chart converts degrees Fahrenheit to degrees Centigrade over the range from −400 to +4000 degrees. Shows temperature ranges of different sensing elements. Thermocouples, resistance bulbs, and radiation



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Bulk and stiffness have been engineered out of this modern hose. An exclusive R/M construction, Homoflex Hose has no pre-set twist . . . it coils and uncoils freely in any direction, eliminating strain at kinking points that can cause internal damage and eventual hose failure. Special engineering creates a homogeneous, inseparable tube-to-cover bond that greatly increases hose life . . . and reduces hose costs! Rugged and strong, flexible as a rope, and light, Homoflex Hose does a *better* job in handling air, water, and other fluids and gases . . . and it lasts longer.

Homoflex Hose maintains uniform inside and outside diameters for faster flow on the job . . . easier fitting of couplings. Ask your R/M representative about types of Homoflex Hose for your operations. He can also show you how other types of R/M Hose for general and special purposes last longer, too . . . give you "More Use per Dollar."

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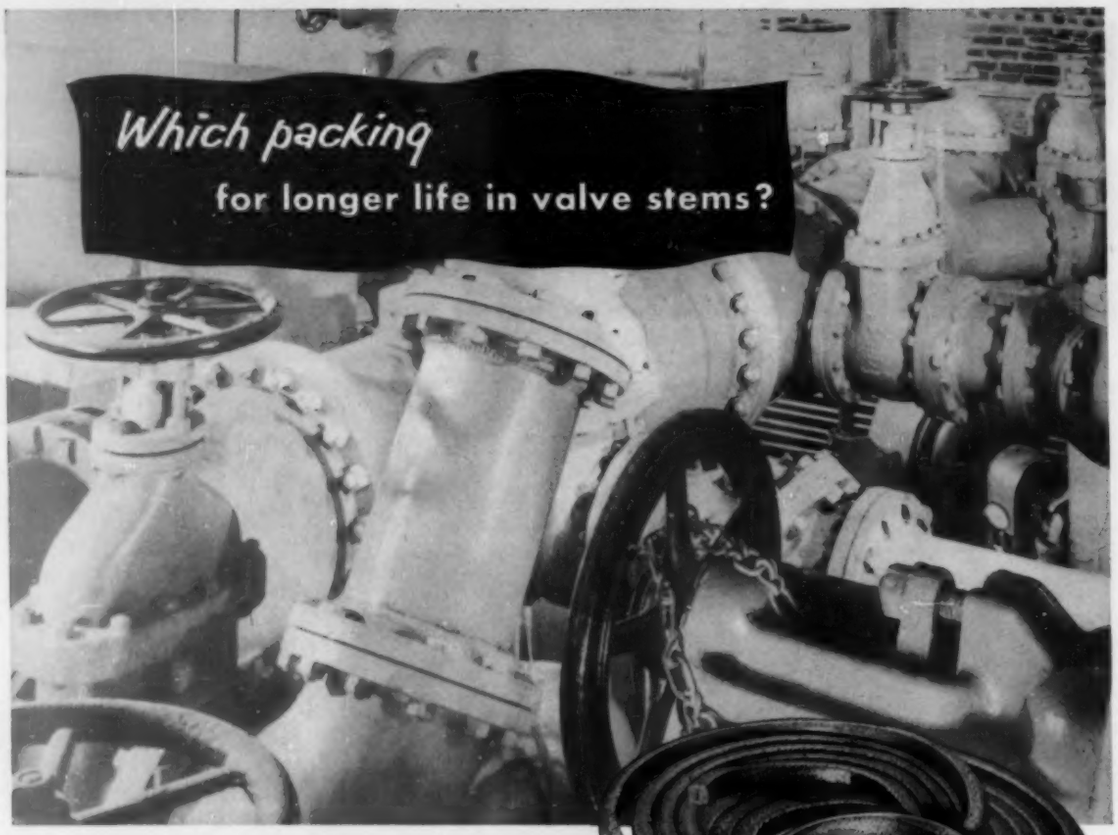

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Strong, tough Jewett has been proven the ideal packing for heavy duty valve stem service against crude and heavy oils, tar, molasses and other heavy gummy fluids. It also provides efficient sealing against steam; fresh or salt, hot or cold water; air; gas and some chemicals requiring a packing free from rubber.

The basis of Jewett's exceptional durability is its construction of high-quality long fibre asbestos yarn with fine copper wire inserts. This yarn is braided over a lead ribbon core and formed square. Style 10 is treated with a heavy bodied, heat-resisting lubricant which won't bleed in valve stem service. Furnished graphited in coil or ring form in sizes from ⅛″ up.

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Johns-Manville PACKINGS, GASKETS and TEXTILES

JM PRODUCTS

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basic bulletins

. . . starts on page 40

heads are shown, with recommendations for installation and maximum limits for both continuous and intermittent service. THERMO ELECTRIC CO., INC.

523-How to select liquid-level control

Bulletin-1 discusses the factors to be considered in selecting a liquid-level control. It includes controls in types and sizes for handling practically any liquid, at any pressure and any temperature. Eight pages. MAGNETROL, INC.

524-Pneumatic systems handbook

Complete discussion of all phases of pneumatic control is contained in Bulletin 1120. Separate sections are devoted to transmission of pneumatic signals, cascade and ratio control, time replay, interconnected control systems, and tuning controllers to your needs. Charts, sectional diagrams, and typical installations are also included. Forty-six pages. MINNEAPOLIS-HONEYWELL REGULATOR CO., BROWN INSTRUMENT DIVISION.

525-Electric instrument manual

Engineering data on instruments for testing and calibrating current-actuated protective devices is contained in Catalog 3561. Application recommendations, illustrations, and schematic diagrams are listed in this catalog. Includes recommendations for electric maintenance personnel on safe techniques for rapid inspection of critical protective equipment. Sixty-eight pages. MULTI-AMP CORPORATION.

MAINTENANCE ITEMS

526-Stainless steel data book

This new data book is a must for every engineer's library. Design and dimensional information on flange drilling templates, flange and ring-joint facings, stainless steel pipe, pipe threads, pressure-temperature ratings and conversion factors, resistance to fluid flow, hardness conversion tables, physical, and mechanical properties of stainless steel are covered. Detailed materials selection chart for more than 300 corrosive solutions is included. Sixteen pages. COOPER ALLOY CORPORATION.

MATERIALS HANDLING (BULK)

527-Wall chart for caustic safety

Handy wall chart gives 37 specific suggestions for safe handling of solid, liquid, and flake caustic soda. Printed in two colors on coated linen stock. Covers first aid measures, protective practices and equipment, dissolving and unloading procedures. DIAMOND ALKALI COMPANY.

528-Conveyor belt slide rule kit

Two slides rules that cut the time required for designing a conveyor belt installation from 3 hours to 10 minutes are now available as part of a conveyor belt construction kit. One is a horsepower calculator, the other a carcass selector. They incorporate the engineering data contained in a 40-page conveyor belting notebook. UNITED STATES RUBBER COMPANY.

529-How to store bulk materials

Storage bins for bulk materials such as ashes, coal, coke, sand or lime are fully discussed in this bulletin. Contains tables of densities of flowable materials, capacities, description of wall construction, test data, and other relevant engineering data with many photographs. Twenty-nine pages. THE NEFF & FRY CO.

MECHANICAL POWER TRANSMISSION

530-V-belt engineering handbook

Complete engineering data including formulas and typical examples for designing V-belt drives are contained in "Engineering Handbook for Multi-V Belts." Includes forty-one pages of preengineered drives for "A" through "E" belt sections. A necessary manual for the library of all power services engineers. Seventy-eight pages. GOODALL RUBBER COMPANY.

HOW TO GET COPIES

To get a free copy of these handbooks, bulletins, and catalogs just circle the key numbers on the READ-N-CIRCLE card on pages 47 or 48.

PIPING, TUBING, AND HOSE

531-How to remove piping deposits

"A Solution to the Problem of Deposits in Piping Systems," describes three principal methods used in cleaning lines: chemical, pipe line pig, and jet moles. Case histories are given to demonstrate where various methods should be used. Four pages. DOWELL, INC.

532-Friction loss chart

Friction loss chart for flexible hose is included in Bulletin 41-44 along with application and technical data. Accessories, installation data, and price lists are included. Eighteen pages. THE FLEXAUST COMPANY.

533-Data on pipe fabrications

Specifications for all sizes of pipe from ⅛ to 24 inches in diameter are presented in Catalog 575C. Tables give data and descriptions of standard, extra strong, and double extra heavy pipe, spiralweld pipe, large od pipe, line pipe, electricweld tubing, welding fittings and flanges, oil well casing, and water well casing. Discusses facilities for fabricating pipe for structural uses. Sixteen pages. L. B. FOSTER CO.

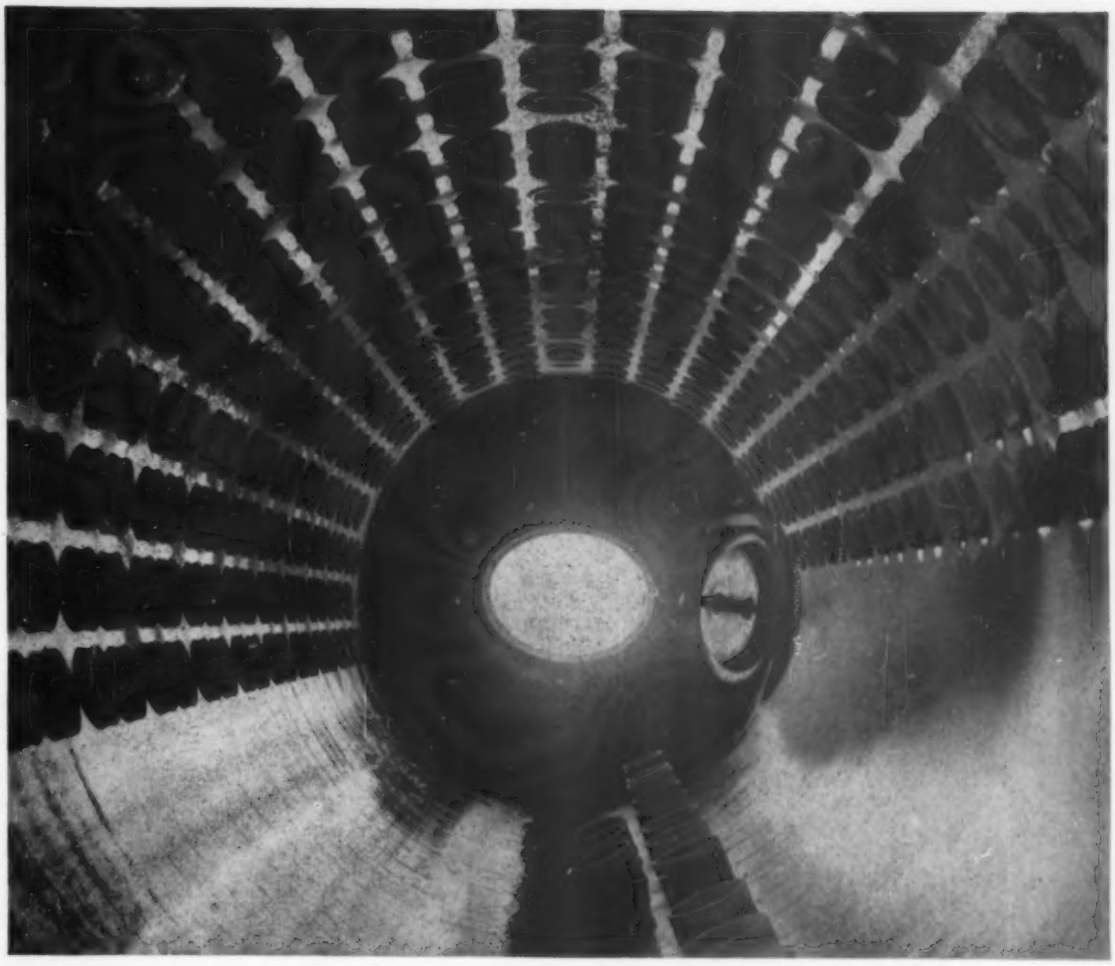
PUMPING EQUIPMENT

534-General-purpose pump manual

Specific engineering data on more than 50 pumps in the complete line are given in Form 7223-B. Describes pumps with capacities from 5 to 2800 gpm, with pressures from 10 to 525 feet total head. Cutaway view shows salient design features. Includes performance data on all pump types (including self-priming, end and side suctions) with electric, diesel, or gasoline-engine drives. Includes a complete list of accessories with recommendations for their application. Twenty pages. INGERSOLL-RAND CO.

535-How to figure pump heads

How to determine total head against which pump must operate is only one of the valuable sections in



Mud drum interior of Boiler No. 9, American Motors Co., Kenosha, Wis.

NO TROUBLE HERE...

When the mud drum of Boiler No. 9 was drained and opened for inspection recently, the interior looked exactly the way everyone expected it would—clean as a whistle. After nine months of service there was no sludge or scale to impair steam production efficiency.

This kind of trouble-free performance and the continuous production of high-purity steam are direct results of Dearborn Water Conditioning—a properly balanced program that combines quality products with the right methods, controls, and technical supervision.

Power Engineers in leading industrial plants throughout the country place their confidence in Dearborn methods and products. A Dearborn Water Conditioning program in your power plant is your assurance of maximum operating efficiency—and your insurance against unnecessary maintenance expense and costly shutdowns caused by sludge, scale or corrosion.

Let a Dearborn Water Treatment Engineer survey your system and recommend control methods best suited to your needs. We'll gladly make the call at your convenience.

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☐ Please have a Dearborn Engineer call.
☐ Send complete details on Dearborn Water Conditioning Program.

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Company.....
Address.....
City.....*Zone*.....*State*.....

Dearborn®

...a leader in water conditioning and corrosion control since 1887

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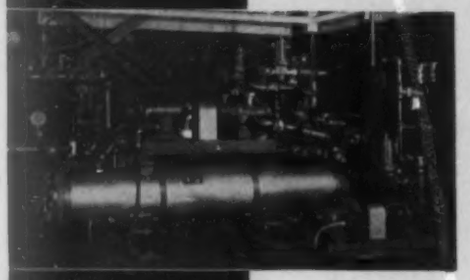
ENCO
Fuel Oil Pumping and Heating Systems

For heavy bunker oil or light furnace oil . . . 100 to 10,000 gallons per hour

Enco systems employ one, two or more pumps and heaters, interconnected so that full capacity is possible with any combination of pumps and heaters. Flexibility of design permits the use of any combination of rotary pumps, with motor or turbine drive; or piston type steam pumps. Any part may be cut out of operation for inspection or cleaning, without shutting down, where two or more pumps and heaters are included in the unit system.



Heaters are insulated and jacketed with removable heads at both ends for cleaning without breaking any piping connections or removing any tube bundles.

Full automatic oil pressure and temperature control, with relief valves for each pump and heater. Permits delivery of oil with safety, and at proper temperature and pressure for efficient burning.

Each unit is built to order and delivered ready to place on foundation and for connection to the station piping.

Write for Bulletin OB-53 describing Enco Gas and Oil Burners; and Pumping and Heating Equipment.

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TUBE EXPANDERS

TUBE CUTTERS

IDEAL

ACCESSORIES

for

Fire Tube Boilers
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Condensers—Coolers
Heat Transfer Units
Refinery Still Tubes
Miscellaneous Tube Units

Write for New Catalog 81

(32)

The Gustav WIEDEKE Company
Dayton 1, Ohio

Circle 135 on READ-N-CIRCLE card for more data

basic bulletins

. . . starts on page 40

Bulletin 353-1000 on the Bilton pump, a general purpose pump suitable for medium and low head service. Twelve pages. BYRON JACKSON PUMPS, INC.

REFRACTORIES AND INSULATION

536-Insulation, refractory handbook

Engineering data, formulas for calculating heat transmission, tables on heat losses from bare surfaces, and equivalent thicknesses of pipes are a part of the technical information contained in Bulletin IP-36A. Also includes descriptions of physical properties of the complete line of products. An excellent handbook containing information on all insulation and refractory problems. Fifty-two pages. JOHNS-MANVILLE.

TRAPS, STRAINERS, AND SEPARATORS

538-Get "bone dry" compressed air

Bulletin describes how ball-float trap eliminates all water and oil from compressed air system. Equipment is entirely mechanical and automatic. Requires no maintenance—has minimum working moving parts. Bulletin contains information on line of after-cooler-separator-filters. JAS. A. MURPHY & CO., INC.

HOW TO GET COPIES

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VIBRATION AND NOISE CONTROL

540-Vibration encyclopedia

This nine-chapter booklet discusses vibration terms, vibration-measuring instruments, procedures, typical examples, and interpretation of results. Describes decibel conversion tables, vibration meters and vibration analyzer equipment. Section is devoted to human response to mechanical vibration. Sixty-four pages. GENERAL RADIO COMPANY.

WATER SUPPLY AND TREATMENT

541-Clean boilers give better operation

Complete water treating service from initial survey to operating report forms is discussed in this bulletin. Describes treatment that stops scale, corrosion, foaming, and carryover by using correct treating compounds. Describes portable water test kit for field use. Gives quick, accurate test of water samples without knowledge of chemistry or involved calculations. Four pages. NORTH AMERICAN MOGUL PRODUCTS COMPANY.

542-All phases of purification

"Boiler Feedwater Treatment," Bulletin BFT-1, covers Inversand zeolite softeners, color process chemical softeners, and demineralizing units, including silica removal by ion exchange. Nineteen pages. HUNGERFORD & TERRY, INC. ♦♦

MARLA
OPEN GEAR SPRAY LUBRICANT

Use on all Gears not running in Oil

Absolutely Nothing Else Like It!
OUTLASTS ORDINARY LUBES 5-to-1
Sticks to Metal

1. ECONOMICAL — Spray container reduces lubrication time. Long lasting film. One can covers approximately 25 sq. ft. of surface with no waste.
2. HEAVY DUTY—The finest extreme pressure adhesive lubricant there is for open gears.
3. EASY-TO-USE—No fuss . . . no muss. Ease of application encourages and assures complete lubrication of open gears.
4. CLEAN—No drip . . . no throw off . . . no clean up of excess lubricant. Will not drip in hot or steamy areas.
5. SPRAY—Assures perfect lubrication even to the most hard-to-get-at areas.
6. HANDY—Marla Spray Lubricant can be carried easily and is always ready for use. Eliminates the brush, paddle or any pre-heating.
7. VERSATILE—A superior lubricant also for cams, reciprocating actions, crane rails, guides, chains, sprockets and cables.

Prices F.O.B. Your Plant

Case of Six—12-ounce Cans $10.74
Case of Twelve—12-ounce Cans 21.00

Manufactured and guaranteed by
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INDUSTRIAL TRACK

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FOSTER *QUALITY* RELAYING RAILS

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new

OXYGEN ANALYZER

Simplifies Flue Gas Analysis

- INSTANT READINGS— ACCURATE TO ± 0.5% O_2
- OPERATES ON FLASHLIGHT BATTERIES—NO CHEMICALS
- COMPLETELY PORTABLE AND SELF-CONTAINED

The new Model D2 Oxygen Analyzer offers speed, convenience, and versatility for industrial use in such applications as: Excess air measurements to improve combustion efficiency; monitoring air leakage in inert systems: insuring safe entry into mines, sewers, and vessels, etc.

OPERATION IS SIMPLE: Merely squeeze a bulb to draw sample gas into the unit, then press a switch and the oxygen content can be read directly and immediately!

RANGE: 0 - 25% O_2.
ACCURACY: ± 0.5% O_2.
WEIGHT: Only 3½ lbs.

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One dependable quality

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renewable fuses

From raw material to final inspection every part is MADE and ASSEMBLED under our own quality control.

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names make news

. . . personalities from industry power

I-T-E Circuit Breaker Company appoints **A. E. Mackenzie** vice president and general manager of its newly acquired subsidiary, Kelman Electric & Manufacturing Company. Mackenzie was formerly district manager of I-T-E's New York office.

John Fritz Medal Board of Award selects **Admiral Ben Moreell,** Jones & Laughlin Steel Corporation board chairman, as 1956 recipient. Award will be made at ASCE's national convention. Award is sponsored by ASCE, AIME, ASME, and AIEE. Admiral Moreell organized and directed Navy Seabees during World War II. He was chairman of the Task Force on Water Resources and Power of the Second Hoover Commission. Admiral Moreell holds the Distinguished Service Medal with Gold Star and the Legion of Merit.

Holmes

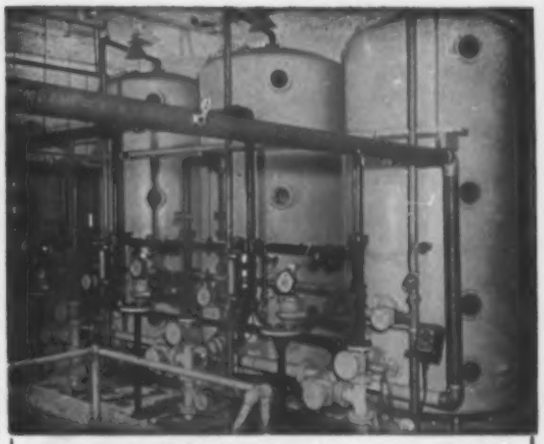
Rockwell

National Association of Power Engineers elects **J. Dudley Holmes** national vice president. Holmes is vice president in charge of the Marine, Power Plant, and Export Division of Magnus Chemical Company, Inc.

Italian government confers order *Al Merito Della Republica* on **Col. Willard F. Rockwell,** board chairman, Rockwell Manufacturing Company. Rockwell was cited for his "outstanding contributions to Italy's reconstruction and economic recovery since World War II."

Westinghouse Electric Corporation names six new Engineering Department managers. **J. W. Batchelor** heads Turbine-Generator Engineering. **M. R. Lory** directs AC Motor and Generator Engineering. **E. H. Myers** heads DC Motor and Generator Engineering. **E. C. Whitney** heads Water Wheel and Synchronous Condenser Engineering. **G. L. Moses** directs Services Engineering. **R. A. Baudry** heads Development Engineering.

ASME elevates **Huldreich Egli,** Egli & Gompf, Inc., and **James Posey,** James Posey and Associates, to rank of Fellow. Both consulting engineers have attained professional acknowledgement in the Baltimore area. ♦ ♦



18,000 GPH H&T UN-A-BED DEMINERALIZER PLANT

. . . a typical H&T installation

Since 1943, we've been building demineralizer plants. All sizes, all capacities—manual or automatic available. Highest quality, attractive prices, fully guaranteed. Hundreds of units in service.

Also a complete line of other water conditioning systems.

Write for details.

H&T SERVICE
HUNGERFORD & TERRY, INC.
CLAYTON 1, NEW JERSEY

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We Die Cut Any Non-Metallic Sheet Material

Prompt Service

FACILITIES — A modern plant to serve your diecutting requirements. Our presses, shears and slitters are capable of handling most non-metallic materials. A complete stock of Asbestos, Felt, Rubber, Cork, Paper, etc., at your disposal. Let us cut either your material or ours. You will be pleased with our service and price.

DIES — A well equipped die department with experienced personnel. Steel rule dies made to close tolerances at minimum cost. All dies produced, stored, and used by us are maintained at no additional expense.

TECHNICAL & CONSULTING SERVICE — Inquiries invited. Specifications met, recommendations made. Our 35 years of experience in gasket engineering at your service.

Let Rhopac Do Your Die Cutting

Rhopac, Inc.

3409 Cleveland Avenue, Skokie, Illinois

Manufacturers of mechanical packings, industrial and boiler gaskets, steel-rule dies, flexible packing hooks.

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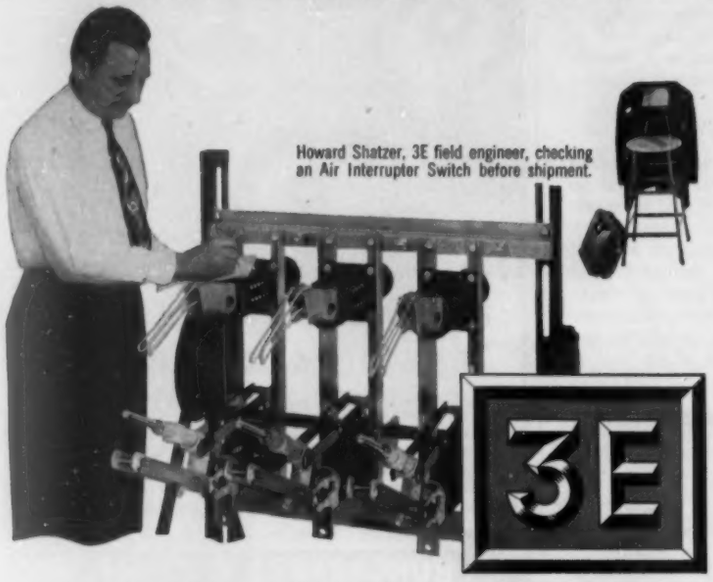
Why be half safe?

Specify AUTO-SPEED interruption . . . 3E Air Interrupter Switches



Howard Shatzer, 3E field engineer, checking an Air Interrupter Switch before shipment.

What is **Auto-speed interruption** . . . an automatically produced interruption that always occurs at the same point in the switching operation, and always takes the same time (one-half cycle). Human error is eliminated from the switching action by a trigger spring mechanism which trips the switch at a pre-set point. Contacts are separated inside a dry type interrupter unit.

Specify safety for personnel and equipment No exposed Arc. 3E Air Interrupter Switches will not produce external arcing dangerous to men or equipment.

Specify economy Costing less than circuit breakers and with interrupting capacity not found in air break disconnects, 3E Air Interrupters are ideal for . . . interrupting magnetizing charging current of transformers . . . interrupting charging current of lines and busses . . . interrupting exciting current of feeder regulators . . . interrupting load currents to rated capacity . . . sectionalizing feeders and distribution circuits.

Specify Engineering Ability 3E's staff of engineers is experienced in adapting or combining equipment for complete switching centers or additions to existing units. Designing for unusual needs . . . corrosive or dusty atmospheres, unique space requirements, portable units, or carefully calculating tomorrow's expansion requirements . . . we are geared to handle the unusual.

Howard Noble, 3E Sales Promotion Mgr., demonstrates Air Interrupters in a complete cubicle installation.

3E Air Interrupter Switches are made in ratings up to 15 K.V.

Write for Bulletin 152

ELECTRICAL ENGINEERS EQUIPMENT CO. Melrose Park, Illinois

Representatives in principal cities—in Canada by Power-Lite Devices, Ltd.

Circle 118 on READ-N-CIRCLE card for more data

handy guide

. . . to advertised products

AIR CLEANING EQUIPMENT

Decantation system useful three ways
Read page 34 and circle number 100
PRAT-DANIEL CORP. P-D system skims off large high-carbon particles, disposes of small flyash particles, reduces tube erosion.

Collect over 99 percent of flyash
Read page 37 and circle number 101
BUELL ENGINEERING COMPANY. Buell LR units require no cleaning or water, give top efficiency.

AIR CONDITIONING, HEATING, VENTILATING

Solve your heating and cooling problems
Read page 2 and circle number 102
JOHNSON SERVICE COMPANY. Johnson controls give economic heating, cooling, ventilating, air conditioning, or process control.

Solve heating problems with gas heaters
Read page 35 and circle number 103
REZNOR MANUFACTURING CO. Gas unit heaters maintain uniform heat at low cost. Use no floor space. Write for more information.

BOILERS AND BOILER ACCESSORIES

Recover your blowoff heat
Read page 50 and circle number 104
COCHRANE CORP. Continuous blowoff system returns flashed steam and heat from hot waste water to your feedwater system.

Economical steam when you want it
Read page 6 and circle number 105
AMES IRON WORKS INC. Ames steam generator needs little maintenance, adjusts easily to changing load demands.

BUILDING CONSTRUCTION, MATERIALS

Stronger raceways save time and money
Read page 33 and circle number 106
THE GLOBE COMPANY. Completely engineered cable raceway system that has twice the strength of ordinary trays is easy to install.

Non-shrink grouting for heavy equipment
Read page 24 and circle number 107
THE MASTER BUILDERS CO. Embeco pre-mixed grout is ready to use, durable.

What kind of oven do you need?
Read page 39 and circle number 108
THE KIRK & BLUM MFG. CO. Ovens in any size, for batch or conveyorized production.

COMING EVENTS

You've got a date in November!
Read page 11 and circle number 109
NATIONAL EXPOSITION OF POWER & MECHANICAL ENGINEERING. Remember November 26-30 in New York's new Coliseum.

COMMUNICATION SYSTEMS

Warning signals save lives, money
Read page 22 and circle number 110
FEDERAL SIGN AND SIGNAL CORP. Beacon Ray moving signal light adds visual impact.

COMPRESSED AIR SUPPLY

Get drier compressed air
Read page 36 and circle number 111
NIAGARA BLOWER COMPANY. Save the cost of cooling water and you save the price of Niagara Aero After Cooler in 2 years.

CORROSION CONTROL

Cut future maintenance costs
Read page 49 and circle number 112
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(more handy guide on page 48)

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Custom constructed assemblies for industrial power systems

All sizes in bronze, stainless or carbon steel, monel, inconel and low carbon nickel. Seamless spiral or parallel corrugation... Braided. All type of fittings and flanges welded, brazed or soldered. Also, interlocked hose.

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ERNST

SIGHT FLOW INDICATORS
"See What Goes On Inside"

For insertion into pipe
FOR EVERY APPLICATION
BRONZE, IRON, STEEL, STAINLESS STEEL

FIG. 29 Cylinder with Impeller

FIG. 17-28 Cylinder

FIG. 215 Flanged

FIG. E-57 Double Window

FIG. 212 Visibility Welding Neck or Screw

FIG. E-811 Flapper

FIG. E-1810 Rotating Wheel Type

All sizes up to 6" *Send for Catalog*

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Better flux—better jobs
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(more handy guide on page 50)

WHY NOTHING PROTECTS LIKE Subox PAINT

Subox paints save money now . . . and through the years to come. They are the only paints in America made with *chemically-active suboxide of lead* — one of the most effective anti-corrosive agents known. It is a heavy colloidal pigment that spreads smoothly, evenly, thoroughly; adheres closely and endures for many years.

Subox* and Subalox* paints are economical to apply, and are so enduring that they greatly reduce future maintenance costs. They largely eliminate the need for scraping and repriming each time repainting is required.

Many of America's foremost industries rely on Subox paints.

If you require corrosion protection in your business, write for the brochure "Subox Paints."

Subox Inc.

Established 1924 6 Fairmount Plant Hackensack, N. J.

See Catalogues in Sweet's Industrial and Engineering Files *Trade Mark

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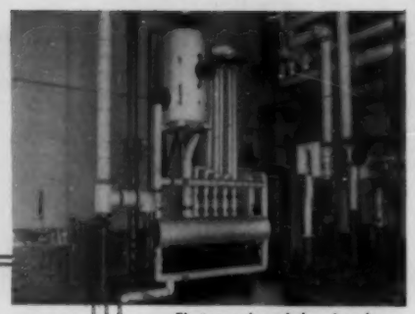

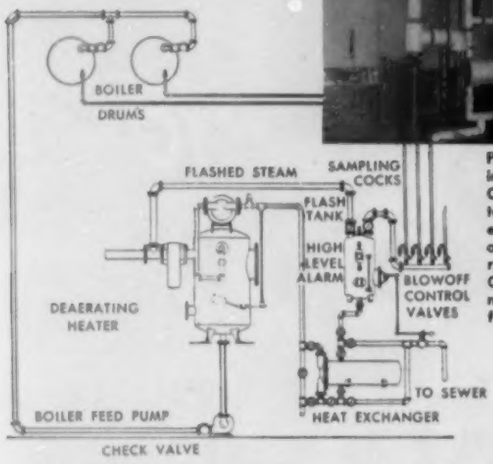

Photograph and drawing showing installation of a Cochrane Class I Continuous Blowoff System of the type most frequently encountered. This sytem is recommended for use where heat recovered from the Cochrane Continuous Blowoff System does not exceed the rating of the feedwater heater.

Here are some typical savings with a **Cochrane**
CONTINUOUS BLOWOFF SYSTEM

- **A Utility: $15,400.00 annually**
- **A Sugar Refinery: 3,500.00 annually**
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- **A Packing Company: 1,500.00 in first year**

(Names of companies on request)

Rising power plant operating costs make complete utilization of heat more important to your company than ever before. With a Cochrane system you can recover practically *all of the heat of the blowoff*. Both flashed steam and heat from hot waste water are returned to the feedwater system.

In addition, Continuous Blowoff provides more uniform boiler concentrations, smoother boiling conditions and cleaner steam.

Cochrane Corporation designs and manufactures complete lines of deaeration, precipitation, ion exchange and water conditioning equipment. Call Cochrane first for water treatment.

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handy guide

. . . starts on page 46

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Super-strong storage bins
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THE NEFF & FRY CO. Super-Concrete stave construction gives bins lateral strength to hold 4000 tons of grain.

PIPING, TUBING, AND HOSE

Seamless metal hose
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Keep heat from raising the roof
Read page 30 and circle number 152
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Keeps motors running like new... The easy, fast way to restore commutators and slip rings — WITHOUT DISMANTLING! — Substitutes low-cost prevention and correction for high-cost repair and rebuilding — COSTS LITTLE, SAVES A LOT.

RESURFACERS
Refinish commutators and rings to like-new condition even when ridged, scored or burned.

MICA UNDERCUTTERS
Stop sparking — help commutation — prolong brush life. For all sizes of commutators.

PRECISION GRINDERS
For more than surface smoothing—under machine's own power. Accurate to .001".

FLEXIBLE ABRASIVE
Cleans and burnishes commutators. Non-dusting. Complete size range.

FREE 39-page Handbook — Complete information on commutator maintenance. MAIL COUPON.
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Circle 104 on READ-N-CIRCLE card

VALVES AND REGULATORS

For a wise valve investment
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CRANE CO. Periodic lubrication is the only maintenance cost with Crane high-pressure valves.

For seatless blowoff valves
Read page 10 and circle number 154
YARNALL-WARING CO. Insist on Yarway valves. Write for full story in Bulletin B-426.

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Demineralizers built in all sizes
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After 9 months—clean as a whistle!
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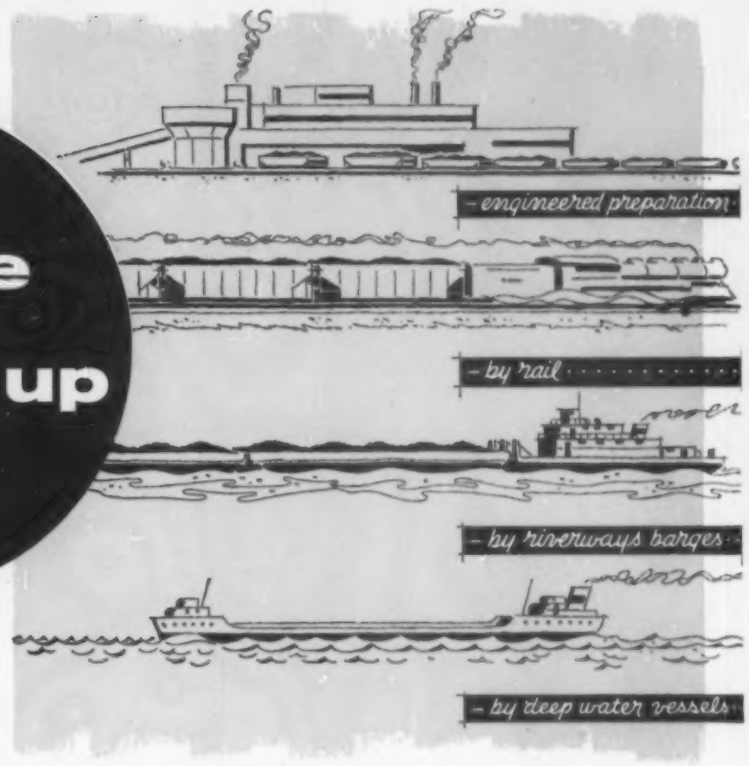
Demineralization troubles?
Read page 55 and circle number 159
INFILCO INC. Infilco custom builds demineralizers to meet your specific problems. Write for the complete story. ♦♦

What a lousy place—first the locker's all full of wires, and now I can't find the pool.

from the ground up



SOUTHERN engineers quality and economy into your coal.

Recovered by modern mechanized methods, it is processed and laboratory tested at *27 ultra modern mines for widely varied industrial applications. You continuously benefit from this rigidly controlled preparation in better boiler performance, and more efficient operation and maintenance.

Wherever your plant is located, there is a dependable Southern coal source affording prompt, efficient shipment at favorable rates by rail, by river barges, or through the Great Lakes to any point in Mid-America.

Ask your Southern representative how Southern's complete coal service assures you maximum value for your coal dollars. There's no obligation.

*

QUALITY PROVEN COALS

23 million tons annually from Eastern and Western Kentucky, Indiana, northern, central and southern Illinois, Ohio, Alabama, Iowa, Missouri & Oklahoma.

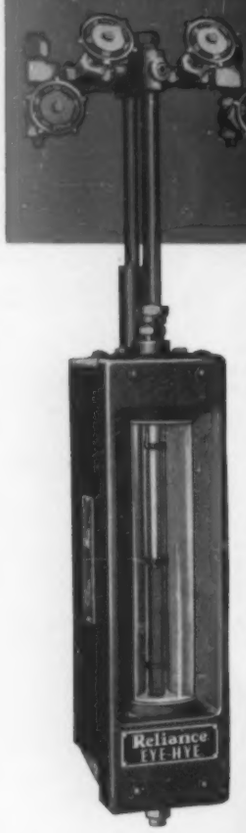
SOUTHERN COAL COMPANY, INC.
GENERAL OFFICE: PRUDENTIAL PLAZA, CHICAGO 1, ILLINOIS
OFFICES IN: LOUISVILLE, MEMPHIS, MINNEAPOLIS, NASHVILLE, ST. LOUIS
SINCLAIR COAL COMPANY, KANSAS CITY 5, MO., WESTERN REPRESENTATIVE

Circle 123 on READ-N-CIRCLE card for more data

Sharp visibility for *all* your liquid levels with

EYE-HYE

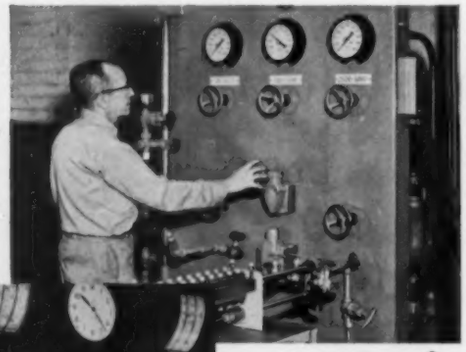
Remote Reading Gage



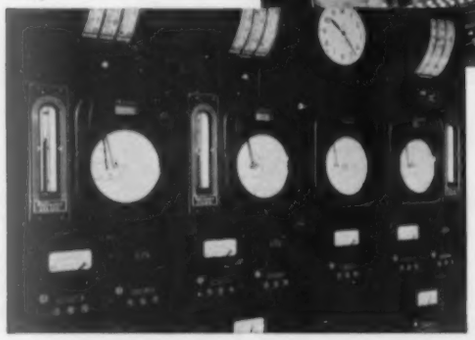
Most important for quick-reading mistake-proof gage equipment are your main boilers — naturally! But other liquid levels need watching — some that can't have "main floor" prominence or convenience.

EYE-HYE brings *all* gage reading out front, to a central point or to locations frequently passed by operators. (See list below.)

Simple, fool-proof, easy to read (illuminated green liquid represents water level), EYE-HYE is made for pressures up to 2500 psi — water level variation to 12 feet. New wide vision face plate makes reading visible from wide area. Write for specific recommendations to bring your gage facilities up to date.



Close-up of panel board section at an important research center where 3 EYE-HYEs serve the main boilers.



How EYE-HYE assemblies get hydraulic test at nearly twice their cataloged pressure rating.

Main boilers **Flash tanks**
Feed Water Heaters
Water treatment systems
Waste heat boilers
Storage tanks

The Reliance Gauge Column Co., 5902 Carnegie Ave., Cleveland 3, Ohio

Reliance EYE-HYE
Remote Reading Gage
All-hydrostatic - Reads like a tubular glass gage

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DURHAM, N. C.: Kirk Cousart & Associates, Box 885.
ERIE, PA.: Engineering Associates, Div., Trymac Inc., 16 West 8th St.
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STONEWALL, GA.: Guy Mankin & Co., Box 612.
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TENAFLY, N. J.: Charles A. Dyson, 9 Coleman Terrace.

AMES IRON WORKS, INC. . . Page 6

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BUFFALO 10, N. Y.: Root, Neal and Co., 64 Peabody St., FAirview 6400.
CHARLESTON 30, W. Va.: Virginian Electric, Inc., Box 2833, 6-0631.
CHARLOTTE 4, N. C.: Mechanical Equipment Co., Box 4066, EDison 3-6105.
GREENVILLE, S. C.: John C. Marshall, Box 1571, 5-5037.
NEW YORK 6, N. Y., 90 West St., WOrth 4-3580.
PHILADELPHIA 4, Pa.: Maleson Company, 225 N. 32nd St., EVergreen 2-6400.
PITTSBURGH 22, PA.: Tranter Mfg. Company, 105 Fort Pitt Blvd., COurt 1-0600.
RICHMOND 19, VA.: O'Neill Pump & Engineering Co., Exchange Bldg., 601 E. Franklin St., 7-4828.
ROCHESTER 9, N. Y.: Siewert Equipment Co., 175 Akron St., HUbbard 9640.
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WHEELING, W. VA.: Interstate Pump Co., 928 Main St., 2310.

BABCOCK & WILCOX CO., REFRACTORIES DIV. . . . . Page 7

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AUGUSTA, GA.: Savannah Road.
BALTIMORE 1, MD.: 516 So. Eutaw St.
BOSTON 10, MASS.: 140 Federal St.
BUFFALO 2, N. Y.: 342 Delaware Ave.
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ARNOLD O. BECKMAN, INC. Page 45

SOUTH PASADENA, CALIF.: 1025 Mission St.

W. H. & L. D. BETZ . . . . . Page 9

PHILADELPHIA 24, PA.: Gillingham & Worth Sts.

BIGELOW-LIPTAK CORP. . . . Page 30

DETROIT 8, MICH.: 2550 W. Grand Blvd.

BUELL ENGINEERING CO. . . Page 37

NEW YORK, N. Y.: 70 Pine St.

BYRON JACKSON PUMPS, INC. . . . . Page 56

See local office listing on Page 56
LOS ANGELES 54, CALIF.: Box 2017, Terminal Annex.

CAMBRIDGE INSTRUMENT CO., INC. . . . . Page 38

NEW YORK 17, N. Y.: 3776 Grand Central Terminal Bldg.

COBRA METAL HOSE, DIV. OF DK MFG. CO. . . . . Page 49

CHICAGO 32, Ill.: 4640 W. 54th St.

COCHRANE CORP. . . . . Page 50

ATLANTA 6, GA.: Boiler Equipment Service Co., 636 Greenwood Ave., N.E.
BALTIMORE 11, MD.: William A. Milby Co., Inc., 2701 Cresmont Ave.
BOSTON 10, MASS.: Cochrane Steam Specialty Co., 55 Batterymarch St.
CHARLOTTE 2, N. C.: Brown & Morrison, 207 Liberty Life Bldg.
HARRISBURG, PA.: Irvin H. Geiger, 216 Locust Street.
NEW YORK 38, N. Y.: Energy Control Co., Inc., 5 Beekman St.
NEW YORK 16, N. Y.: Cochrane Corp., 261 Madison Ave.
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RICHMOND 6, VA.: The Hawkins-Hamilton Co., 401-04 American Bldg.
ROCHESTER 18, N. Y.: David R. Mixsell Co., 1470 Monroe Ave.
WASHINGTON 6, D. C.: Robert M. Austin, Barr Bldg.
WASHINGTON 6, D. C.: Meleney Engineering Co., 720 Mills Bldg.

CONTINENTAL ELECTRIC EQUIPMENT CO. . . . . Page 4

BALTIMORE 29, MD.: Murray Nelson, 500 Kingston Rd.
GREENSBORO, N. C.: E. T. Green, Box 5034.
JACKSONVILLE, FLA.: Charles W. Spengler, 1668 Parrish Pl.
MIAMI, FLA.: Anson Fyler, 3150 Commodore Plaza.
NEW YORK 63, N. Y.: Peter Schurman, 3299 Cambridge Ave.
PHILADELPHIA 3, PA.: Anderson & Levy Co., 1635 Race St.
TAMPA, FLA.: Continental Electric Equipment Co., 3015 Fourth Ave.
WILLIAMSVILLE 21, N. Y.: L. E. Markle, Jr., 235 Hopkins Rd.

CRANE CO. . . . . Page 28

ALBANY 1, N. Y.: North Broadway.
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WEST PALM BEACH, FLA.: 217 Fifth St.

DARLING VALVE MFG. CO. . Page 36

WILLIAMSPORT, PA.: Walnut & Marshall Sts.

DEARBORN CHEMICAL CO. Page 43

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ECONOMY FUSE & MFG. CO. . . . . Page 25

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ELECTRIC AUTO-LITE CO. . . Page 32

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ELECTRICAL ENGINEERS EQUIPMENT CO. . . . . Page 46

MELROSE PARK, ILL.: Division St.

ENGINEER CO. . . . . Page 44

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SYRACUSE, N. Y.: Wm. J. Goff & Son, Box 850 SYracuse 75-7092.
W. ENGLEWOOD, N. J.: Foster Equipment Co., 145 Sussex Rd. DUmont 4-0730.
WORCESTER, MASS.: Eastern Power Equip. Co., 14 Einhorn Road.

ERNST WATER COLUMN & GAGE CO. . . . . Page 49

LIVINGSTON, N. J.: 252 S. Livingston Ave.

FEDERAL SIGN & SIGNAL CORP. . . . . Page 22

CHICAGO 19, ILL.: 8700 S. State St.

L. B. FOSTER CO. . . . . Page 44

PITTSBURGH 30, PA.: Box 1647.

GENERAL COAL CO. . . . . Page 5

PHILADELPHIA, PA.: 123 S. Broad St.

GLOBE CO. . . . . Page 33

ATLANTA, GA.: Jas. B. Barton, Jr. Company, 450 Forrest Ave., N.E., VErnon 1188.
BOSTON, MASS.: Power Products Company, 11 Claflin St., Framingham, Mass., TRinity 2-0330.
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RICHMOND, VA.: Richmond Steel Company, 18th and Byrd Streets, 3-1963.

GRAPHIC SYSTEMS INC. . . . Page 32

NEW YORK, N. Y.: 55 W. 42nd St.

HUNGERFORD & TERRY, INC. . . . . Page 45

ARLINGTON 9, VA.: D. M. Hungerford, 1300 Arlington Blvd., Apartment 21010, JAckson 7-3672.
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CLAYTON, N. J.: F. C. Myers, 236 Atlantic Ave., GLassboro 4-3200.

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TROY, N. Y.: Schultz-Forster Assoc., 251 River St., Burdett Building, AShley 2-5160.

IDEAL INDUSTRIES, INC. . . . Page 50

SYCAMORE, ILL.: 1006 Park Ave.

INFILCO INC. . . . . Page 55

TUCSON, ARIZ.: 901 S. Campbell

I-T-E CIRCUIT BREAKER CO., SWITCHGEAR DIV. . . . . Page 8

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BOSTON 16, MASS.: 31 St. James Ave.
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TAMPA 11, FLORIDA: Robert P. Smith, 3611 South Coolridge St., Box 13103.
WASHINGTON, D. C.: 1012 14th Street, North West.

JERGUSON GAGE & VALVE CO. . . . . Page 37

ATLANTA 5, GA.: Ward K. Stallings Co., 3120 Maple Drive N.E., EXchange 0600.
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JOHNSON SERVICE CO. . . . Page 2

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KIRK & BLUM MFG. CO. . . . . Page 39

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LAKE CHEMICAL CO. . . . . Page 31

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MANHATTAN RUBBER DIV. RAYBESTOS-MANHATTAN, INC. . . . . Page 41

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PHILADELPHIA, PA.
PITTSBURGH, PA.

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MERCOID CORP. . . . . Page 38

CHICAGO 41, Ill.: 4217 Belmont Ave.

MONARCH ELECTRIC CORP. . . . . Page 45

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NATIONAL AIROIL BURNER CO. . . . . Page 39

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GREENVILLE, S. C.: F. W. Phillips, Box 782.
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PHILADELPHIA, PA.: W. E. Bierlin, Box 4910.
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SOUTH ORANGE, N. J.: T. W. Feeley, 308 Clark St.
SPARTANBURG, S. C.: R. F. Bagwell, Jr., Box 2286.

NIAGARA BLOWER CO. . . . . Page 36

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NORTH AMERICAN MOGUL PRODUCTS CO. . . . . Page 23

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PALMER THERMOMETERS, INC. . . . . Page 35

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PRAT-DANIEL CORP. . . . . Page 34

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CRANFORD, N. J.: John L. Lehman, 12 Pittsfield St.
E. PROVIDENCE, R.I.: Edward J. Feeley, Jr., 152 Warren Ave.
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FORT LAUDERDALE, FLA.: George F. Begoon, 915 Las Olas Blvd.
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NEW YORK 17, N.Y.: Francis C. Hayes, 295 Madison Ave.
OLNEY, MD.: William F. Goddard, 202 King William Dr.
ORANGEBURG, S. C.: Applied Engineering Co., Inc., 468 Carolina Ave., N. E.
PITTSBURGH 20, PA.: Mechanical Equipment Co., 522 S. Main St.
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SPRINGFIELD, MASS.: Charles A. Phelan, Jr., 1537 Main St.
WATERVLIET, N.Y.: Joseph Y. Fowler, 205 8th Ave.
WORCESTER, MASS.: Curtis W. Novak, 4 Einhorn Rd.

RAYBESTOS-MANHATTAN, INC. . . . . Page 41

See Manhattan Rubber Div.

RELIANCE GAUGE COLUMNS CO. . . . . Page 52

ATLANTA 3, GA.: Spotswood Parker & Company, 313 Techwood Drive, N.W.
BOSTON 10, MASS.: Cochrane Steam Specialty Company, 55 Batterymarch St.
BUFFALO 7, N. Y.: The Stone Company, 1807 Elmwood Ave.
CHARLESTON 24, W. VA.: Engineering Products Company, Box 1107.
CHARLOTTE 1, N. C.: Mec-Tric Control Company, 113 South Brevard St., Box 354.
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ROCHESTER 9, N. Y.: The Stone Company, 1038 Winton Road.
WASHINGTON 6, D. C.: Meleney Engineering Company, 720 Mills Bldg.

REZNOR MFG. CO. . . . . Page 35

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WASHINGTON, D. C.: 1627 K St., N.W., REpublic 7-0116 or REpublic 7-8176.
WYCKOFF, N. J.: 235 Van Houten Ave., WYckoff 4-0592.

RHOPAC, INC. . . . . Page 45

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ROTHLAN CORP. . . . Pages 32 & 44

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SOUTHERN COAL CO. . . . . Page 51

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SPECO, INC. . . . . Page 24

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SUBOX, INC. . . . . Page 49

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PHILADELPHIA, PA.: John O. Claflin, 110 Radnor-Chester Rd., Radnor, Penna.
SALEM, VA.: Geo. L. Wallace, 746 Elizabeth Ave.

SUPERIOR ELECTRIC CO. . Page 26

BRISTOL, CONN.: 385 Laurel St.

THERMIX CORP. . . . . Page 34

See Prat-Daniel Corp.

GUSTAV WIEDEKE CO. . . . . Page 44

DAYTON 1, OHIO: Parrot & Richard Sts.

EDWIN L. WIEGAND CO. . . . Page 34

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BALTIMORE 18, MD.: Paul V. Renoff Co., 333 E. 25th St., HOpkins 7-3280-81.
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coming events

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Oct. 8-10	ASME Lubrication Conference	Atlantic City, New Jersey
Oct. 11-12	Armour Research Foundation Nat'l Noise Abatement Symposium	Sherman Hotel, Chicago
Oct. 22-24	Seventeenth Annual Water Conference	Hotel Wm. Penn, Pittsburgh
Oct. 24-25	ASME Fuels Conference	Washington, D. C.
Nov. 25-30	ASME Annual Meeting	Hotel Statler, New York City
Nov. 25-30	ASME Power Show	Coliseum, New York City
Nov. 26-30	Third International Automation Exposition	Trade Show Building, New York City
Dec. 3-5	Air Pollution Control Association Semiannual Meeting	Rice Hotel, Houston, Texas
	1957	
Jan. 21-25	AIEE Winter General Meeting	Hotel Statler, New York City

send in your

cartoon ideas

Ever run across situations in your plant that gave you a real chuckle? Share those situations with your fellow readers of INDUSTRY POWER. We will send you $5 for every cartoon idea accepted, $10 per finished cartoon sketch accepted. (Sketches must be in black ink on heavy white paper, about six inches by six inches square.)

Just two conditions apply: Cartoon ideas must pertain to the Basic Power Services, and they must be in good taste. Otherwise, the field for your cartoon ideas is wide open. Send along your ideas and sketches to

H. A. Bergen, Editor
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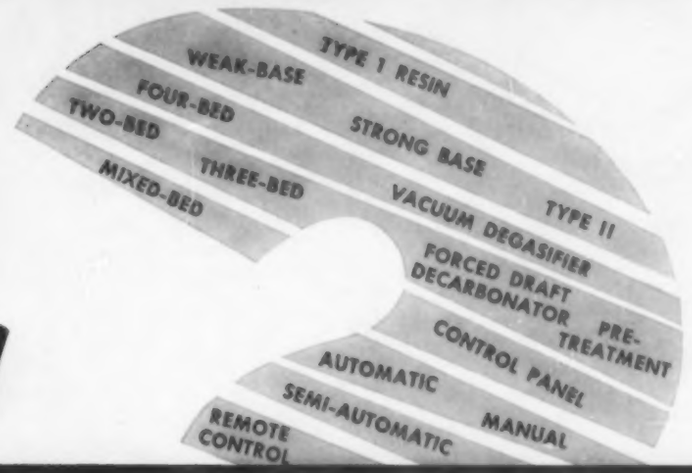
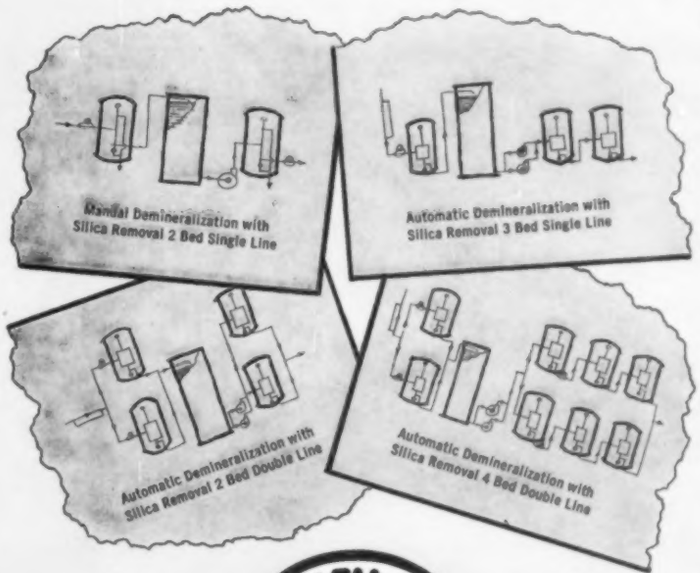
*WHAT'S YOUR PROBLEM in DEMINERALIZATION



*INFILCO demineralizers are custom-built to solve the specific problems of each power plant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*The one best design for equipment to demineralize boiler feed water make-up depends on the characteristics of the water to be treated, boiler pressure and design, quantity of make-up required and many other variables peculiar to each installation. The best solution for one plant may be a manually operated two-bed demineralizer; in other cases three-bed, four-bed or mixed-bed demineralizers—manual or automatic—may be indicated.

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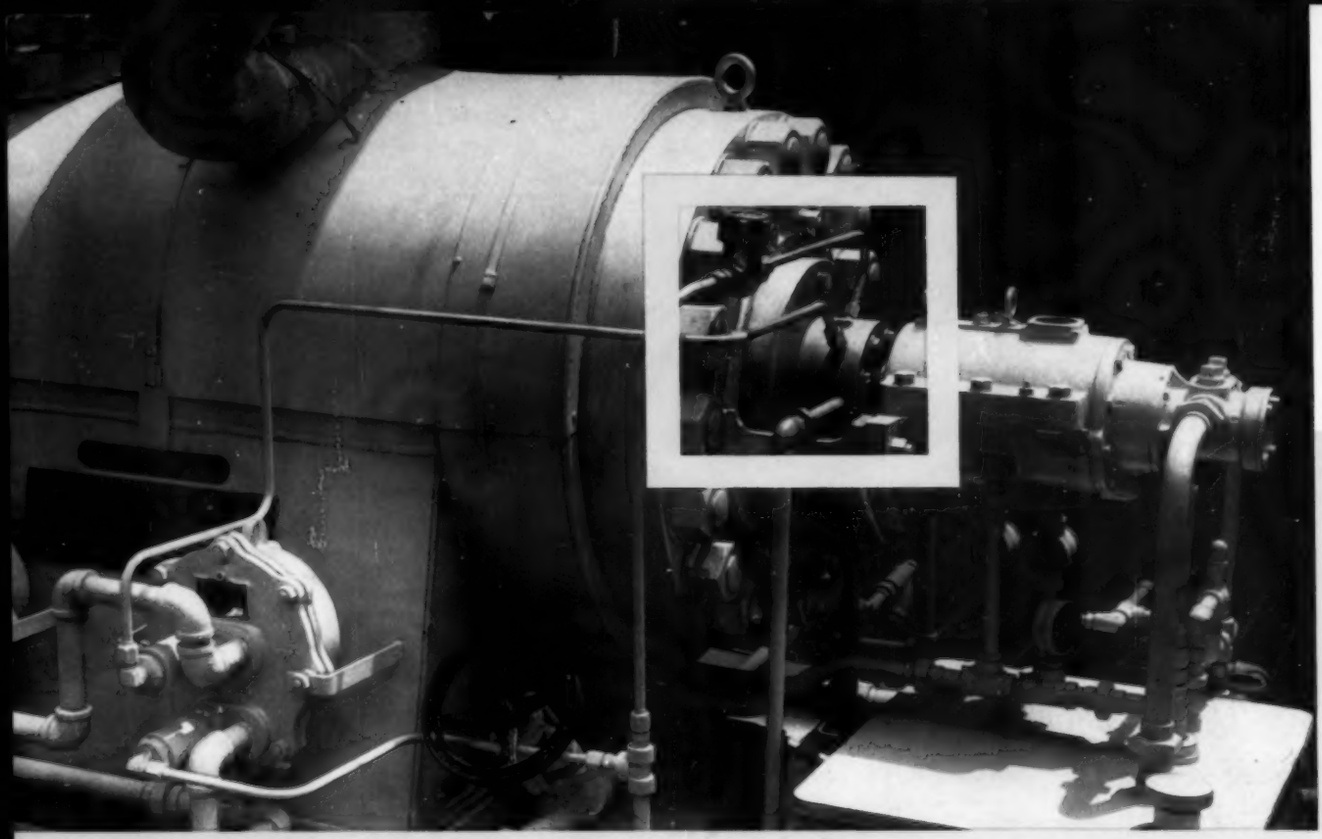

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